

United States. Circuit Court of Appeals for
the Second District.

NEW YORK PHONOGRAPH COMPANY, Complainant -
Appellee versus

THE NATIONAL PHONOGRAPH COMPANY, Impleaded,
Etc., Defendant - Appellant

TRANSCRIPT OF RECORD

Appeal from the Circuit Court of the United
States for the Southern District of New York.
Volume II. (b)

C. L. Buckingham
38 Park Row

United States Circuit Court of Appeals
FOR THE SECOND CIRCUIT

THE NEW YORK PHONOGRAPH COMPANY
Complainant-Appellee

vs.

THE NATIONAL PHONOGRAPH COMPANY, IMPEADED, ETC.
Defendant-Appellant

TRANSCRIPT OF RECORD

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR
THE SOUTHERN DISTRICT OF NEW YORK

VOL. II.

PRINTED UNDER THE DIRECTION OF THE CLERK

I N D E X.

	PAGE
Bill of Complaint.....	1
Amendment to Bill of Complaint.....	21
Answer	1328
Replication.....	22

TESTIMONY.

Thomas A. Edison—	
Direct	24
Cross.....	155
John F. Randolph—	
Direct.....	159, 224
Cross.....	232
Redirect.....	236
John R. Hardin—	
Direct	185
Cross	219
Redirect.....	221
Recross.....	223
J. Adriance Bush—	
Direct	240
John P. Haines—	
Direct	268
Cross.....	310, 340
Redirect	338, 351
Recross	353
William E. Gilmore—	
Direct	353
Recalled	532
Thomas R. Lombard—	
Direct.....	445
Cross.....	482
Redirect.....	520
Recross.....	529
Re-redirect.....	530

II

	PAGE
Daniel F. Lewis—	
Direct.....	541
Cross.....	546
Redirect.....	557
Recross.....	561
Re-redirect.....	569
James L. Andem—	
Direct.....	569
Cross.....	606
Recross.....	647
Redirect.....	648
Louis Hicks—	
Direct.....	671
Cross.....	673

1. NUMERICAL INDEX TO COMPLAINANT'S EXHIBITS.

[NOTE.—“Exhibit Page” indicates the page of the book of *Complainant's Exhibits* where each of the exhibits are set forth; “Record Page” indicates the page of *Complainant's Testimony* where each exhibit was offered in evidence.]

Exhibit No.	Exhibit page.	Record page.
1. Subpoena <i>duces tecum</i> to T. A. Edison, W. E. Gilmore, Edison Phonograph Co., Edison Phonograph Works and National Phonograph Co., dated Nov. 24, 1902.....	675	29
2. Subpoena <i>duces tecum</i> to T. A. Edison, W. E. Gilmore, Edison Phonograph Co., Edison Phonograph Works, and National Phonograph Co., dated July 16, 1902.....	679	94
3. Agreement between T. A. Edison and J. H. Lippincott, dated June 28, 1888 (see Exhibit No. 46, p. 180).....	682	98
4. Agreement between T. A. Edison and Edison Phonograph Co., dated October 28, 1887.....	683	99

III

Exhibit No.		Exhibit page.	Record page.
5.	Agreement between T. A. Edison and Edison Phonograph Works, dated May 12, 1888.....	690	99
6.	Agreement between T. A. Edison, Edison Phonograph Works, North American Phonograph Co. and J. H. Lippincott, dated October 10, 1888 (see Exhibit No. 46, p. 200)	695	99
7.	Agreement between T. A. Edison, Edison Phonograph Co., Edison Phonograph Works, North American Phonograph Co. and J. H. Lippincott, dated Oct. 12, 1888.....	695	105
8.	Agreement between Edison Phonograph Co., Edison Phono- graph Works, T. A. Edison, J. H. Lippincott and North Ameri- can Phonograph Co., dated January 22, 1890.....	703	106
9.	Affidavit of T. A. Edison, with copy of Agreement of Aug. 1, 1888, between Edison, N. A. Phono. Co. and Lippincott an- nexed, in case of American Graphophone Co. <i>vs.</i> Walcutt, verified Dec. 6, 1894.....	706	110
10.	Bill of Complaint, National Phonograph Co., Edison Phono- graph Works, and New York Phonograph Co., against Colum- bia Phonograph Co. and E. D. Easton, filed Oct. 9, 1896.....	711	111
11.	(Identical with Exhibit No. 10, except as indicated).....	724	111
12.	Order, filed December 9, 1896, discontinuing suit of National Phonograph Co., Edison Phono- graph Works and New York		

IV

Exhibit No.		Exhibit page.	Record page.
	Phonograph Co. against Colum- bia Phonograph Co. and E. D. Easton, on patents 382,418, 382,462, 400,648, 414,761 and 430,274 (for complaint, see Ex- hibit No. 10).....	727	111
13.	Order, filed Dec. 9, 1896, discon- tinuing suit of National Phono- graph Co., Edison Phonograph Works and New York Phono- graph Co. against the Columbia Phonograph Co. and E. D. Eas- ton, on patents 386,974, 430,278, 484,583, 484,584 and 499,879 (for complaint, see Exhibit No. 11).	728	111
14.	Agreement between Edison Phonograph Co. and National Phonograph Co., dated April 2, 1900	729	112
15.	Certificate of Incorporation, Na- tional Phonograph Co., dated January 25, 1896.....	731	113
16.	Notice of John R. Hardin, Re- ceiver, dated Feb. 15, 1895 (iden- tical with Exhibit A of Exhibit No. 36, page 130).....	734	114
17.	Advertisement soliciting sub- scriptions for stock of North American Phonograph Co.....	734	115
18.	Notice to the public by T. A. Edison, in <i>fac simile</i> of his handwriting, that National Phonograph Co. is the only company making and selling genuine Phonographs	737	116
19.	Notice to Dealers on Phonograph Record Box, signed T. A. Edison, and registered in Patent Office, containing list of patents, &c..	737	117

Exhibit No.		Exhibit page.	Record page.
20.	Record Slip, registered in U. S. Patent Office by National Phonograph Co., N. Y.....	738	117
21.	Letter from North American Phonograph Co. to Ohio Phonograph Co., dated January 23, 1894, regarding rented Phonograph.....	739	121
22.	Supplemental Agreement between the North American Phonograph Co. and the New York Phonograph Co., dated July 1, 1893.....	739	124
23.	Agreement between American Graphophone Co. and the National Phonograph Co. and Edison Phonograph Works, dated Dec. 7, 1896.....	746	127
24.	Bill of Sale of local company contracts by John R. Hardin, Receiver North American Phonograph Co., to Frederick P. Ott, dated Feb. 18, 1896, and acknowledged March 21, 1896.....	750	127
25.	Bill of Sale of assets of North American Phonograph Co. by John R. Hardin, Receiver North American Phonograph Co., to National Phonograph Co., dated Feb. 18, 1896, and acknowledged March 21, 1896.....	762	127
26.	Check of T. A. Edison for \$7,500 endorsed to order of John R. Hardin, Receiver (printed in Record, p. 128, at Q. 667, testimony of Edison)	775	128
27.	Plea, American Graphophone Co. v. Ed. Phonograph Works (printed in Exhibit No. 46, pp. 169, 178).....	775	136

VI

Exhibit No.		Exhibit page.	Record page.
28.	Affidavit of Thomas A. Edison, etc. (see Exhibit No. 36, p. 120, which is a certified copy thereof)	775	140
29.	Amended Complaint, American Graphophone Co. v. Ed. Phono- graph Works (printed in Exhibit No. 46, p. 169).....	775	144
30.	Replication, American Grapho- phone Co. v. Ed. Phonograph Works (printed in Exhibit No. 46, pp. 169, 229).....	775	144
31.	Plate of Phonograph Patents used by North Amer. Phono. Co. (printed in Record at p. 150, Q. 776, testimony of Edison).....	775	150
32.	Assignment of Phonograph Patents by John R. Hardin, Receiver North American Phonograph Co., to National Phonograph Co., dated Oct. 5, 1896.....	776	181
33.	Assignment of Phonograph patents by John R. Hardin, Re- ceiver North American Phono- graph Co., to National Phono- graph Co., dated October 5, 1896	778	181
34.	Certificate of Incorporation of the Edison Phonograph Co., dated Sept. 30, 1887.....	781	183
35.	Certificate of Incorporation of the Edison Phonograph Works, dated April 30, 1888.....	785	183
36.	(Feb. 17, 1902) Certificate of In- corporation of the North Amer- ican Phonograph Co., dated July 14, 1888.....	789	183
36.	(Feb. 19, 1902) Notice of Motion to apportion time to take testi- mony in case of American Graphophone Co. vs. Edison		

VII

Exhibit No.		Exhibit page.	Record page.
	Phonograph Works for Jan. 28, 1896.....	794	185
36	Affidavit of T. A. Edison in fore- going case, verified Jan. 23, 1896	795	185
"	(Exhibit A.) Notice of John R. Hardin, Receiver North Amer- ican Phonograph Co. soliciting bids for property of North Amer- ican Phonograph Co., dated Feb. 15, 1895.....	804	185
"	(Exhibit B.) Notice of John R. Hardin, Receiver North Amer- ican Phonograph Co., to its creditors and stockholders of bid of Thomas A. Edison for its entire assets, dated March 28, 1895.....	807	185
"	(Exhibit C.) Order of Chancellor McGill in case of W. W. Cutting, Exr., vs. North American Phono- graph Co., dated May 6, 1895, directing receiver not to accept Edison's bid and to proceed against Edison to procure assign- ment of patents, etc.....	808	185
"	(Exhibit D.) Order of Chancellor McGill in case of W. W. Cutting, Exr., vs. North American Phono- graph Co., dated Dec. 26, 1895, directing creditors and stock- holders to show cause why an offer of compromise by T. A. Edison to J. R. Hardin, Receiver, should not be accepted.....	811	185
"	Offer of compromise, T. A. Edison to J. R. Hardin, Receiver, dated December 21, 1895.....	812	185
"	(Exhibit E.) Order of Vice-Chan- cellor J. R. Emery directing Receiver J. R. Hardin to accept		

VIII

Exhibit No.		Exhibit page.	Record page.
	compromise offer of T. A. Edison and Edison Phonograph Co....	815	185
36	(Exhibit F.) Notice of J. R. Hardin, Receiver North Amer- ican Phonograph Co., offering for sale assets of North Amer- ican Phonograph Co., dated Jan. 20, 1896.....	822	185
37.	Order to show cause setting forth Edison's offer of compromise (identical with Exhibit D of Exhibit No. 36, of Feb. 19, 1902, <i>supra</i> , printed at page 137)....	828	192
38.	Final Decree, on consent of Howard W. Hayes, for injunc- tion against Edison Phonograph Works, in case of Hardin, Re- ceiver, <i>vs.</i> Edison Phonograph Works, dated January 21, 1896.	829	198
39.	Injunction against Edison Phono- graph Works, issued by Chan- cellor McGill February 3, 1896..	830	198
40.	Edison's offer of compromise (forming part of Exhibit D of Exhibit 36, printed on page 137)	831	201
41.	Order of discontinuance in case of J. R. Hardin, Receiver, North American Phonograph Co. <i>vs.</i> T. A. Edison, dated January 21, 1896.....	832	212
42.	Letter, dated July 25, 1895, R. N. Dyer, attorney for Ed. Phono. Works, to J. R. Hardin, Re- ceiver, threatening that Ed. Phono. Works would sell Phono- graphs to the public (this exhibit is set out in the Record at p. 216, Q. 136, testimony of Hardin)...	833	216
43.	Subpoena <i>duces tecum</i> to T. A. Edison, Edison Phonograph		

IX

Exhibit No.		Exhibit page.	Record page.
	Co., Edison Phonograph Works, National Phonograph Co., John R. Hardin, J. Adriance Bush and John F. Randolph, dated February 7, 1903.....	833	218
44.	Subpoena <i>duces tecum</i> to National Phonograph Co., John F. Ran- dolph, Edison Phonograph Co., Edison Phonograph Works and William E. Gilmore, dated Feb. 17, 1903.....	837	224
45.	Subpoena <i>duces tecum</i> to W. E. Gilmore, National Phonograph Co., John R. Hardin, J. Adri- ance Bush, John F. Randolph, Edison Phonograph Co., Edison Phonograph Works, dated Feb. 7, 1903.....	839	239
46.	Amended Bill of Complaint, American Graphophone Co. <i>vs.</i> Edison Phonograph Works, filed Jan. 19, 1895.....	843	241
"	Plea of Edison Phonograph Works to amended Bill of Com- plaint of American Graphophone Co., filed January 22, 1895.....	852	241
"	Agreement between T. A. Edison and J. H. Lippincott, dated June 28, 1888.....	854	241
"	Contract annexed and agreed to be executed between Edison and the American Phonograph Co., dated , 1888.....	859	241
"	Contract annexed and agreed to be executed between Edison Phonograph Works and Amer- ican Phonograph Co., dated , 1888.....	863	241
"	Agreement between T. A. Edison, the North American Phono-		

X

Exhibit No.		Exhibit page.	Record page.
	graph Co. and J. H. Lippincott, executed and dated August 1, 1888.....	866	241
46	Agreement between the North American Phonograph Co. and Jesse H. Lippincott, and the Edison Phonograph Works, ex- ecuted and dated August 1, 1888	871	241
"	Agreement between T. A. Edison, Edison Phonograph Works, the North American Phonograph Co. and Jesse H. Lippincott, dated Oct. 10, 1888.....	874	241
"	Agreement between T. A. Edison, the North American Phonograph Co. and Jesse H. Lippincott, dated August 1, 1888 (same as above).....	876	241
"	Agreement between North Amer- ican Phonograph Co. and J. H. Lippincott, and the Edison Phonograph Works, dated August 1, 1888 (same as above).	880	241
"	Agreement between J. H. Lippin- cott and the American Grapho- phone Co., dated August 6, 1888	883	241
"	Agreement between T. A. Edison and Jesse H. Lippincott, dated June 28, 1888 (same as above)..	885	241
"	Agreement annexed and agreed to be executed between T. A. Edison and American Phono- graph Co., dated 1888 (same as above).....	890	241
"	Agreement annexed and agreed to be executed between the American Phonograph Co. and the Edison Phonograph Works, dated 1888 (same as above)	894	241

XI

Exhibit No.		Exhibit page.	Record page.
46	Supplemental agreement between the American Graphophone Co. and J. H. Lippincott, dated Aug. 6, 1888.....	896	241
"	(Replication, filed January 29, 1895, American Graphophone Co. vs. Edison Phonograph Works).....	903	241
47.	(Of March 18, 1903.) Subpœna <i>duces tecum</i> to J. Adriance Bush, dated March 5, 1903.....	904	248
47.	(Of April 16, 1903.) Agreement between the North American Phonograph Co. and the New York Phonograph Co., dated June 13, 1889, and annexed thereto the agreement between the North American Phono- graph Co. and John P. Haines, dated Feb'y 6, 1889.....	926	275
48.	Agreement between the North American Phonograph Co. and the Metropolitan Phonograph Co., dated Jan. 10, 1889.....	934	274
49.	(Agreement between North Am. Phono. Co. and J. P. Haines, dated Feb. 6, 1889, printed on page 233)	937	270
50.	(Agreement between North Amer- ican Phonograph Co. and the Metropolitan Phonograph Co., dated October 12, 1888, printed on page 264).....	938	271
51.	Agreement between the North American Phonograph Co. and the Metropolitan Phonograph Co., dated June 23, 1890, and annexed thereto the agreement between the North American Phonograph Co. and the Metro-		

XII

Exhibit No.		Exhibit page.	Record page.
	politan Phonograph Co., dated October 12, 1888.....	264,	956 277
52.	Consolidation Agreement between the New York Phonograph Com- pany and Metropolitan Phono- graph Co.....		291
52.	Consent of North American Phono- graph Co. to the consolidation of the New York Phonograph Co. and the Metropolitan Phono- graph Co., dated May 10, 1890..	965	277
"	Agreement between the Metro- politan Phonograph Co. and the New York Phonograph Co., dated May 10, 1890.....	986	277
"	Proceedings at stockholders' meeting of the New York Phonograph Co. to consolidate with Metropolitan Phonograph Co., held June 25, 1890.....	974	277
"	Proceedings at stockholders' meeting of the Metropolitan Phonograph Co. to consolidate with the New York Phonograph Co., held June 25, 1890.....	984	277
53.	Certificate of incorporation of the Metropolitan Phonograph Co., dated October 1, 1888.....	996	278
54.	Certificate of incorporation of the New York Phonograph Co., dated February 8, 1889.....	999	278
55.	Preliminary prospectus of the Metropolitan Phonograph Co...	1003	391
56-71.	(These exhibits are extracts from the minutes of New York Phono- graph Company, and are set out in the record as shown at Re- cord, page 311, x-Q 240, testi- mony of Haines).....	1018	311

XIII

Exhibit No.	Exhibit page.	Record page.
72. Agreement dated July 1, 1893, between North American Phono- graph Co. and New York Phonograph Co. (identical with Ex. 22, except as noted).....	1018	322
73. Letter of W. E. Gilmore, Mgr. Edison Phonograph Works, to Walcutt, Miller & Co., dated March 10, 1896.....	1019	362
74. Jobbers' Agreement with National Phonograph Co., dated Jan. 2, 1902.....	1019	375
75. List prices of Phonographs, Re- cords and Blanks, discounts and conditions of sale, issued by Na- tional Phonograph Co., dated May 1, 1901.....	1021	376
76. Notice published regarding con- ditions of sale of Phonographs by National Phonograph Co....	1027	377
77. List of suspended dealers, issued by National Phonograph Co., January 15, 1900.....	1027	378
78. List of suspended dealers, issued by National Phonograph Co., February 10, 1902.....	1030	378
79. Agreement between National Phonograph Co. and dealers re- garding trade discounts, de- liveries, &c., dated March 25, 1899.....	1033	379
80. Trade circular letter issued by National Phonograph Co., May 2d, 1898, agreeing to hold its dealers harmless.....	1034	379
81. Circular letter issued to the public by National Phonograph Co., April 1, 1898, regarding Edison Phonograph speakers, etc.....	1035	379

XIV

Exhibit No.		Exhibit page.	Record page.
82.	Letter of W. E. Gilmore, Manager Edison Phonograph Works, to E. F. Leeds, dated March 26, 1896.....	1036	390
83.	Trade circular issued by the National Phonograph Co., March 4, 1903, regarding Lambert infringement.....	1037	397
84-85.	Plates of Edison Phonograph patents used by Edison Phonograph Works and National Phonograph Co. (these two exhibits are set out in the Record at page 402, Q. 293, testimony of Gilmore).....	1039	401
86.	Retail Dealers Agreement issued by National Phonograph Co., Jan. 2, 1902.....	1039	411
87.	Retail Dealers' Price List, discounts, &c., issued by National Phonograph Co., May 1, 1900..	1041	413
88-100.	(Printed booklets of National Phonograph Co.)...372, 437, 440,	1115	442
101.	Release of National Phonograph Co. to John R. Hardin, Receiver North American Phonograph Co., dated August 19, 1898.....	1046	443
102.	Agreement, J. H. Lippincott with the North American Phonograph Co., July 17, 1888, transferring phonograph and graphophone rights.....	1051	449
103.	(Agreement between T.A. Edison, North American Phonograph Co., and J. H. Lippincott, August 1, 1888, printed on page 192).....	1054	456
104.	(Agreement between North American Phonograph Co., J. H. Lippincott and Edison Phono-		

Exhibit page.	Record page.
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32
33	33
34	34
35	35
36	36
37	37
38	38
39	39
40	40
41	41
42	42
43	43
44	44
45	45
46	46
47	47
48	48
49	49
50	50
51	51
52	52
53	53
54	54
55	55
56	56
57	57
58	58
59	59
60	60
61	61
62	62
63	63
64	64
65	65
66	66
67	67
68	68
69	69
70	70
71	71
72	72
73	73
74	74
75	75
76	76
77	77
78	78
79	79
80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

XVI

Exhibit No.		Exhibit page.	Record page.
	ceiver, of certain Phonograph patents, dated January 16, 1896	1070	536
115.	Assignment by Thomas A. Edison to J. R. Hardin, Receiver, of certain Phonograph patents, dated Jan. 16, 1896.....	1073	536
116.	Assignment by T. A. Edison to the Edison Phonograph Co. of certain Phonograph patents, dated May 8, 1900.....	1076	536
117.	Assignment by T. A. Edison to the Edison Phonograph Co. of certain Phonograph patents, dated July 27, 1888.....	1077	536
118.	Assignment by T. A. Edison to the Edison Phonograph Co. of cer- tain Phonograph patents, dated July 27, 1888.....	1080	536
119.	Assignment by T. A. Edison to National Phonograph Co. of patent 713,209 for duplicating phonograms, dated December 16, 1902.....	1082	537
120.	Assignment by T. A. Edison to National Phonograph Co. of Phonograph patent 622,843, dated April 26, 1901.....	1084	537
121.	Assignment by T. A. Edison to National Phonograph Co. of patent 667,662 for duplicating records, dated Dec. 24, 1901....	1086	537
122.	Assignment by T. A. Edison to National Phonograph Co. of patent 604,740 for improvement in governors for motors, dated October 2, 1901.....	1088	537
123.	Assignment by T. A. Edison and the North American Phonograph Co. to the Edison Phonograph Co. of certain Phonograph patents, dated May 22, 1893....	1089	537

XVII

Exhibit No.		Exhibit page.	Record page.
124.	Assignment by T. A. Edison and the North American Phonograph Co. to the Edison Phonograph Co. of Phonograph patent 281,453, dated May 23, 1893.....	1092	537
125.	Petition of New York Phonograph Co. to Chancellor McGill in case of Cutting <i>vs.</i> North Am. Phonograph Co., dated April 24, 1895.	1094	538
"	Ch. McGill's order to J. R. Hardin to show cause in above case....	1101	538
"	Answer of J. R. Hardin, Receiver, to petition of N. Y. Phono. Co.	1102	538
"	Order of reference to the Vice-Chancellor.....	1107	538
"	Order of Chancellor McGill directing payment of Royalties.....	1108	538
126.	Restraining order of Chancellor McGill in case of New Jersey Phonograph Co. <i>vs.</i> North American Phonograph Co., dated Nov. 24, 1893.....	1112	538
127.	Order for injunction <i>pendente lite</i> against Edison Phonograph Works to restrain sale of Phonographs, dated Oct. 21, 1895.....	1114	538
128.	Order of Chancellor McGill providing the manner in which J. R. Hardin, Receiver North American Phonograph Co., shall sell Phonographs, dated Sept. 20, 1894.....	1116	538
"	Order of Chancellor McGill directing Receiver Hardin not to accept bid of T. A. Edison, and to procure assignment from him of Phonograph patents, dated May 6, 1895.....	1119	538
129.	Affidavit of Thomas A. Edison forming part of complaint in suit of Cutting <i>vs.</i> North American Phonograph Co., dated August 15, 1894.....	1123	579

XVIII

[NOTE.—The following exhibits are set out in the testimony and are not printed in the Book of Exhibits.]

Exhibit No.	Record page.
130. Letter North American Phonograph Co. to Ohio Phonograph Co., dated May 4, 1894.....	579
131. Letter North American Phonograph Co. to Ohio Phonograph Co., dated July 20, 1894.....	579
132. Edison patents relating to the phonograph.....	595—Exhibit page 459
133. Extract from the Phonographic News of May and June, 1895, relating to spring motor Edison Phonographs.....	606
134. Extract from the Phonographic News of May and June, 1895, relating to spring motor Edison Phonographs...	606
135. Extract from the Phonographic News of May and June, 1895, relating to spring motor Edison Phonographs...	606
136. Extract from the Phonographic News of May and June, 1895, relating to promised improvements in the Phonograph.....	606
137. Letter dated January 17, 1890, North American Phonograph Co. to the phonograph companies.....	606
138. Letter dated July 30, 1890, North American Phonograph Co. to the phonograph companies.....	606
139. Letter dated August 1, 1890, North American Phonograph Co. to the phonographic companies.....	606
140. Catalogue of musical phonograms for the phonograph issued by North American Phonograph Co. in 1890...	606
141. Advertisement of New York Phonograph Co. in the Phonogram of January, 1893.....	648

XVIX

Exhibit No.		Record page.
142.	Advertisement of the North American Phonograph Co. in the Phonogram of January, 1893.....	648
143.	Letter National Phonograph Co. to E. F. Leeds, dated May 6, 1896.....	672
144.	Letter National Phonograph Co. to E. F. Leeds, dated May 11, 1896.....	673
145.	Agreement.....	1305
146.	Bill of complaint.....	1313

II. COMPLAINANT'S EXHIBITS BY TOPICS.

AGREEMENTS AND CONTRACTS.

No.		Exhibit page.
4.	Oct. 28th, 1887. Between Edison and Edison Phonograph Co.....	683
5.	May 12, 1888. Between Edison and Edison Phonograph Works.....	690
3, 46.	June 28, 1888. Between Edison and Lippincott.....	682-854-885
102.	July 17, 1888. Between Lippincott and North Am. Phono. Co.....	1051
104, 46.	Aug. 1, 1888. Between North Am. Phono. Co., Lippincott and Ed. Phono. Works.....	1055-871
103, 46.	Aug. 1, 1888. Between Edison, North Am. Phono. Co. and Lippin- cott.....	1054-866
46.	Aug. 6, 1888. Between Lippincott and Am. Graphophone Co.....	883
46.	Aug. 6, 1888. Between Lippincott and Am. Graphophone Co.....	896
6, 46.	Oct. 10, 1888. Between Edison and Ed. Phono. Works, North Am. Phono. Co. and Lippincott.....	695-874
7.	Oct. 12, 1888. Between North Am. Phono. Co., Edison, Edison Phono. Co., Edison Phono. Works and Lippincott	695

No.		Exhibit page.
50.	Oct. 12, 1888. Between North Am. Phono. Co. and Met. Phono. Co...	938
3, 46.	———, 1888. Between Edison and Am. Phono. Co.....	682-859-890
3, 46.	———, 1888. Between Edison Phono. Works and Am. Phono. Co.....	682-863-894
48.	Jan. 10, 1889. Between North Am. Phono. Co. and Met. Phono. Co..	934
49, 47.	Feb. 6, 1889. Between North Am. Phono. Co. and Haines.....	937-907
47.	June 13, 1889. Between North Am. Phono. Co. and N. Y. Phono. Co.	907-926
8.	Jan. 22, 1890. Between Edison Phono. Works, Lippincott and North Am. Phono. Co.....	703
52.	May 10, 1890. Between N. Y. Phono. Co. and Met. Phono. Co.....	966-986
51.	June 23, 1890. Between North Am. Phono. Co. and Met. Phono. Co..	938-956
22 & 72.	July 1, 1893. Between North Am. Phono. Co. and N. Y. Phono. Co.	739-1018
23.	Dec. 7, 1896. Between Am. Grapho. Co., Natl. Phono. Co. and Edison Phono. Works.....	746
14.	April 2, 1900. Between Edison Phono. Co. and National Phono. Co.....	729

• ASSIGNMENT OF PATENTS.

117.	July 27, 1888. Edison to Edison Phonograph Co.....	1077
118.	July 27, 1888. Edison to Edison Phonograph Co.....	1080
123.	May 22, 1893. Edison and North Am. Phono. Co. to Edison Phono. Co.....	1089
124.	May 23, 1893. Edison and North Am. Phono. Co. to Edison Phono. Co..	1092

XXI

No.		Exhibit page.
128.	May 6, 1895. Edison to Hardin, Receiver (order for).....	1119
114.	Jan. 16, 1896. Edison Phono. Co. to Hardin, Receiver.....	1070
115.	Jan. 16, 1896. Edison to Hardin, Receiver.....	1073
32.	Oct. 5, 1896. Hardin, Receiver, to Natl. Phono. Co.....	776
33.	Oct. 5, 1896. Hardin, Receiver, to Natl. Phono. Co.....	778
116.	May 8, 1900. Edison to Edison Phono. Co.....	1076
120.	Apl. 26, 1901. Edison to Natl. Phono. Co.....	1084
122.	Oct. 2, 1901. Edison to Natl. Phono. Co.....	1088
121.	Dec. 24, 1901. Edison to Natl. Phono. Co.....	1086
119.	Dec. 16, 1902. Edison to Natl. Phono. Co.....	1082

CERTIFICATES OF INCORPORATION.

34.	Sept. 30, 1887. Edison Phonograph Co.....	781
35.	Apl. 30, 1888. Edison Phonograph Works.....	785
36.	July 14, 1888. North Am. Phono. Co.....	789
53.	Oct. 1, 1888. Met. Phono. Co.....	996
54.	Feb. 8, 1889. The N. Y. Phono. Co.	999
52.	Sept. 12, 1890. New York Phono. Co.....	965
15.	Jan. 25, 1896. National Phono. Co.	731

SUBPŒNAS ISSUED.

2.	July 16, 1902. To Edison, Gilmore, Ed. Phono. Co., Edison Phono. Works, Natl. Phono. Co.....	679
----	--	-----

XXII

No.		Exhibit page.
1.	Nov. 24, 1902. To Edison, Gilmore, Ed. Phono. Co., Edison Phono. Works, Natl. Phono. Co.....	675
43.	Feb. 7, 1903. To Edison Phono. Co., Edison, Edison Phono. Works, Natl. Phono. Co., Hardin, Bush and Randolph	833
45.	Feb. 7, 1903. To Gilmore, Edison Phono. Co., Edison Phono. Works, Natl. Phono. Co., Hardin, Bush and Randolph	839
44.	Feb. 17, 1903. To Gilmore, Edison Phono. Co., Edison Phono. Works, Natl. Phono. Co. and Randolph...	837
47.	Mch. 5, 1903. To J. A. Bush.....	904

AFFIDAVITS.

129.	Aug. 15, 1894. T. A. Edison (insol- vency, N. A. P. Co.).....	1123
9.	Dec. 6, 1894. T. A. Edison (Amer. Graph. Co. v. Walcutt)	706
28 & 36.	Jan. 23, 1896. T. A. Edison (Graph. Co. v. Phono. Works).....	775-795

PLEAS AND ANSWERS.

27 & 46.	Jan. 22, 1895. Edison Phono. Works to Am. Graph. Co.....	775-852
30 & 46.	Jan. 29, 1895. Replication, Am. Graph. Co. v. Edison Phono. Works.....	775-903

BILLS OF COMPLAINT.

10 & 11.	Natl. Phono. Co., Edison Phono. Works and N. Y. Phono. Co. vs. Columbia Phono. Co.....	711-724
29 & 46.	Am. Grapho. Co. vs. Edison Phono. Works.....	775-843

XXIII

No.

Exhibit
page.

ORDERS OF COURT, DECREES, ETC.

12 & 13.	Discontinuing suit of Nat. Phono. Co., Edison Phono. Works and N. Y. Phono. Co. vs. Columbia Phono. Co.....	727-728
36.	Motion to take test, Am. Graph. Co. v. Ed. Phono. Works.....	794
36.	Order in Cutting vs. North Am. Phono. Co.....	808-811
36.	Directing receiver not to accept Edison's bid and to proceed.....	808
36.	Directing Harding, Receiver, to accept Edison's offer of compromise.	815
36, 37.	Order to show cause on foregoing order	811-828
38.	Final decree for injunction against Edison Phono. Works	829
39.	Injunction against Edison Phono. Works.....	830
127.	Order for injunction <i>pendente lite</i> against Ed. Phono. Works.....	1114
41.	Discontinuing case of Hardin v. Edison.....	832
126.	Restraining order, New Jersey Phono. Co. v. N. A. P. Co.....	1112
128.	Sale of machines by Receiver, manner of.....	1116
128.	Refusing bid of Edison; ordering assignment of patents.....	1119

NOTICES AND PROCEEDINGS.

52.	June 25, 1890. Consolidation Met. and N. Y. Phono. Cos.....	984
52.	June 25, 1890. Consolidation N. Y. and Met. Phono. Cos.....	974
125.	Apr. 24, 1895. Petition of N. Y. Phono. Co.....	1094, 1108

XXIV

No.		Exhibit page.
16 & 36.	Feb. 15, 1895. Notice of J. R. Hardin, Receiver	734-804
36.	Mch. 28, 1895. Notice of J. R. Hardin, Receiver	807
	Jan. 20, 1896. Notice of J. R. Hardin, Receiver	822
112-113.	Oct. 15, 1903. Notice and order to take testimony of Gilmore	1066-1068

OFFERS OF COMPROMISE AND CONSENTS, RE- LEASE, ETC.

36 & 40.	Compromise offer, T. A. Edison to Hardin, Receiver.....	812-831
36, 37.	Order to show cause why compromise should not be accepted.....	811-828
36.	Order directing acceptance of above.	815
38.	Consent to injunction; Hardin and Edison Phono. Works	829
52.	Consent of North Am. Phono. Co. to consolidation of Metropolitan and New York Phono. Cos.....	965
101.	Release of National Phono. Co. to Hardin, Receiver.....	1046

LETTERS MARKED AS EXHIBITS.

137.	Jan. 17, 1890, North American Phono- graph Co. to Phonograph com- panies (see Record, p. 602).....	
107.	Feb. 3, 1890. North American Phono. Co. to the phonograph companies (Cir. letter No. 19).....	1055
138.	July 30, 1890. North American Phonograph Co. to phonograph companies (see Record, p. 604)....	
139.	Aug. 1, 1890. North American Phonograph Co. to the phonograph companies (see Record, p. 604)....	

XXV

No.		Exhibit page.
108.	Dec. 4, 1890. North American Phono. Co. to the phonograph companies (Cir. letter No. 49).....	1056
109.	Dec. 16, 1890. North American Phono. Co. to the phonograph companies (Cir. letter No. 51).....	1060
21.	Jan. 23, 1894. North American Phonograph Co. to Ohio Phono- graph Co.....	739
130.	May 4, 1894. North American Phonograph Co. to Ohio Phono- graph Co. (see Record, p. 577)....	
131.	July 20, 1894. North American Phonograph Co. to Ohio Phono- graph Co. (see Record, p. 578)....	
42.	July 25, 1895. Dyer to Hardin, Re- ceiver.....	833
73.	Mar. 10, 1896. Gilmore to Walcutt, Miller & Co.....	1019
82.	Mar. 26, 1896. Gilmore to Leeds...	1036
143.	May 6, 1896. National Phonograph Co. to E. F. Leeds (see Record, p. 672).....	
144.	May 11, 1896. National Phonograph Co. to E. F. Leeds (see Record, p. 673)	

LETTERS NOT MARKED AS EXHIBITS, BUT READ
INTO THE RECORD.

	PAGE
Jan. 22, 1889, Thomas A. Edison to New York Tribune (see Record, p. 575).....	
Oct. 17, 1889, North American Phonograph Co. to the phonograph companies (see Record, p. 579).....	
1892, Thomas A. Edison to local phonograph companies (see Record, pp. 571, 468, 469).....	

- Jan. 25, 1894, North American Phonograph Co. to Ohio Phonograph Co. (see Record, p. 620).....
- Sept. 25, 1894, New York Phonograph Co. to Hardin, Receiver (Defendant's Record, p. 300; Haines, x-Q. 104).....
- Oct. 3, 1894, New York Phonograph Co. to Hardin, Receiver (Defendant's Record, p. 298; Haines, x-Q. 102).....
- Oct. 3, 1894, New York Phonograph Co. to N. A. Phono. Co. (Defendant's Record, p. 300; Haines, x-Q. 103).....
- May 6, 1895, Edison to Hardin, Receiver, waiving Court House sale (see Record, p. 218).....
- Feb. 10, 1896, New York Phonograph Co. to Thomas A. Edison (Defendant's Record, p. 229; Fahnestock Re-x-Q. 397).....
- Feb. 21, 1896, New York Phonograph Co. to Thomas A. Edison (Defendant's Record, p. 229; Fahnestock, Re-x-Q. 397).....
- May 24, 1897, United States Phonograph Co. to Ohio Phonograph Co. (see Record, p. 585).....
- Mar. 15, 1898, H. W. Jessup to R. N. Dyer (Defendant's Record, p. 120; Dyer, Q. 5)..
- Apr. 4, 1898, R. N. Dyer to H. W. Jessup (Defendant's Record, p. 127; Dyer, x-Q. 9)..
- Apr. 5, 1898, H. W. Jessup to R. N. Dyer (Defendant's Record, p. 126; Dyer, x-Q. 9)..
- Apr. 5, 1898, R. N. Dyer to H. W. Jessup (Defendant's Record, p. 127; Dyer, x-Q. 9)..
- Apr. 19, 1898, H. W. Jessup to R. N. Dyer (Defendant's Record, p. 125; Dyer, x-Q. 7)..
- Apr. 21, 1898, R. N. Dyer to H. W. Jessup (Defendant's Record, p. 122; Dyer, Q. 5).....
- Apr. 23, 1898, R. N. Dyer to H. W. Jessup (Defendant's Record, p. 123; Dyer, Q. 5)....
- Feb. 1, 1901, Circular letter of New York Phonograph Co. (see Record, p. 647).....

XXVII

PAGE

June 4, 1902, New York Phonograph Co. to Central Trust Co. (see Record, p. 324)....	
June 23, 1902, New York Phonograph Co. to Thomas A. Edison (see Record, p. 346)...	
June 26, 1902, Thomas A. Edison to New York Phonograph Co. (see Record, p. 347).....	
July 2, 1902, New York Phonograph Co. to Thomas A. Edison (see Record, p. 347)...	
July 7, 1902, Thomas A. Edison to New York Phonograph Co. (see Record, p. 347).....	

BILLS OF SALE.

No.		Exhibit page.
24.	Feb. 18, 1896. J. R. Hardin, Receiver, to F. P. Ott.....	750
25.	Feb. 18, 1896. J. R. Hardin, Receiver, to Natl. Phono. Co.....	762
32.	Oct. 5, 1896. J. R. Hardin, Receiver, to Natl. Phono. Co.....	776
33.	Oct. 5, 1896. J. R. Hardin, Receiver, to Natl. Phono. Co.....	778

PUBLIC NOTICES, CIRCULAR LETTERS, ETC.

17.	Advertisement offering stock of North Am. Phono. Co.....	734
18.	T. A. Edison, Natl. Phono. Co. only company making and selling Phono- graphs.....	737
16.	Hardin, Receiver, offering assets of North American Phono. Co., Feb. 15, 1895.....	734, 804
19.	T. A. Edison, Notice to dealers (on record box)	737
20.	Record Slip, Natl. Phonograph Co.....	738
26.	T. A. Edison's Check to Hardin, Re- ceiver.....	775
31.	Plate of Phono. patents used by North Amer. Phono. Co.....	775
36.	Hardin, Receiver, offering assets of North Am. Phonograph Co., Jan. 20, 1896.....	822

XXVIII

No.	Exhibit page.
55. Prospectus, Metropolitan Phonograph Co.....	1003
56-71. Extracts from minutes of New York Phono. Co.....	1018
74. Jobbers' Agreement, Natl. Phono. Co..	1019
75. Trade price list, Natl. Phono. Co....	1021, 1041
76. Conditions of sale, Natl. Phono. Co....	1027
77, 78. Lists of suspended dealers, Natl. Phono. Co.....	1027-1030
79, 86, 87. Dealers' Agreements, Natl. Phono. Co.....	1033, 1039, 1041
80. Circular letter, infringements. Natl. Phono. Co.....	1034
81. Circular letter, speakers, Natl. Phono. Co.....	1035
83. Circular letter, Lambert infringement, Natl. Phono. Co.....	1037
84-85. Plates of Edison Phono. patents used by Ed. Phono. Wks. and Natl. Phono. Co.....	1039
88-100. Printed Booklets issued by Natl. Phono. Co.....	1046
105-106. Restriction plates used by North Amer. Phono. Co.....	1055
107. Circular letter No. 19, North Amer. Phono. Co.....	1055
108. Circular letter No. 49, North Amer. Phono. Co.....	1056
109. Circular letter No. 51, North Amer. Phono. Co.....	1060
110. Machine lease, North Am. Phono Co.	1061
111. Stock Certificate, North Am. Phono. Co.	1065
133-136. Notices relating to Spring Motor Phonographs published in "Phonographic News" for May and June, 1895 (see Record, pp. 598-600).....	
140. Catalogue issued by North Amer. Phono. Co. in 1890 of musical phonograms (see Record, p. 603).....	

XXX

STIPULATIONS, STATEMENTS OR ADMISSIONS.

	Record page.
That subpoena, Exhibit 2, is list sent by Mr. Edison to counsel.....	94
That Mr. Edison's counsel had copy of subpoena (Exhibit 1).....	95
That six documents produced by Mr. Edison were all that could be found under the subpoenas (Exhibits 1 and 2).....	97, 107
That Exhibit 3 came from possession of Mr. Edison.....	98
That Exhibit 8 came from possession of Mr. Edison.....	106
As to production by Mr. Edison of Exhibits 23, 24 and 25, being contracts to which Nat. Phono. Co. was a party.....	127
That Exhibit 36, being a certified copy, may be used in place of Mr. Edison's original affidavit, being Exhibit 28	185
That copies of orders of court annexed to Exhibit 36 are true copies	185
That Exhibit D of Exhibit 36 is identical with Exhibit 37.....	192
That Exhibit 14 is a true copy.....	409
Statement of Randolph refusing to produce documents called for by subpoena.....	224
Statement of Gilmore refusing to produce documents called for by subpoena	419
That Exhibit 101 is a true copy of the original Statement by Gilmore's counsel refusing to produce documents under subpoena and order of court.....	531

REQUESTS TO DEFENDANT'S COUNSEL TO PRODUCE.

Contract of Dec. 7, 1896 (Exhibit 23).....	112
Assignments of patents to Nat. Phono. Co. dated Oct. 5, 1896.....	113
Stock-book of Nat. Phono. Co.....	164
List used by Randolph in making search.....	171

XXXI

PAGE

Record
page.

Assignment to Hardin, Receiver of phonograph patents applied for subsequent to August 1, 1888.....	195, 209
Assignment to Edison Phono. Co. of phonograph patents applied for on or before August 1, 1888.....	196-209
Assignment by Edison Phono. Co. to Hardin, Receiver, of patents applied for subsequent to August 1, 1888	197-209
Papers received by Nat. Phono. Co. under conveyances from Hardin, Receiver...	206, 368, 371
Stock-books, minute-book of Nat. Phono. Co., and checks paid to Mr. Edison.....	231
Request by defendant's counsel that extracts from minutes, Exhibits 56 to 72, be offered in evidence.....	311
Request by defendant's counsel that Exhibit 72 be offered in evidence.....	331
Request that defendant's counsel produce defendant's president under subpoena served	339

PAGE

Plea and Answer.....	1328
Stipulation <i>re</i> signatures to depositions.....	1488
" " Complainant's Exhibits 114-124	1488
" " Letters.....	1451
" " By-Laws N. Y. Co.....	1602

DEPOSITIONS.

Andem, James L.—	
Direct-examination.....	1681
Cross "	1694
Redirect "	1702
Recross "	1705
Redirect "	1709
Bradley, Frank E.—	
Direct-examination.....	1637
Cross "	1639

XXXII

	PAGE
Burke, Victor E.—	
Direct-examination.....	1640
Cross “.....	1648
Redirect “.....	1659
Recross “.....	1661
Camp, Elisha K.—	
Direct-examination.....	1723
Clerihew, Alexander C.—	
Direct-examination.....	1710
Cross “.....	1713
Redirect “.....	1721
Recross “.....	1721
Redirect “.....	1722
Dyer, Richard N.—	
Direct-examination.....	1443
Cross “.....	1452
Fahnestock, William—	
Direct-examination.....	1340
Cross “.....	1380
Redirect “.....	1420
Recross “.....	1554
Redirect “.....	1568
Recross “.....	1602
Redirect “.....	1609
Funston, Hugh M—	
Direct-examination.....	1583
Cross “.....	1539
Redirect “.....	1544
Recross “.....	1550
Redirect “.....	1552
Gottschalk, Felix—	
Direct-examination.....	1520
Cross “.....	1525
Redirect “.....	1532

XXXIII

	PAGE
Haines, John P.—	
Direct-examination.....	1485
Cross “.....	1487
Direct “ (recalled).....	1611
Cross “.....	1624
Redirect “.....	1630
Recross “.....	1636
Kelsey, John Price—	
Direct-examination.....	1665
Cross “.....	1668
Redirect “.....	1678
Pelzer, William—	
Direct-examination.....	1678
Cross “.....	1680
Randall, Frederick C.—	
Direct-examination.....	1431
Cross “.....	1442
Direct “ (recalled).....	1485
Schermerhorn, John R.—	
Direct-examination.....	1488
Cross “.....	1497
Redirect “.....	1520
Upham, John B.—	
Direct-examination.....	1482
Cross “.....	1485
Walcutt, Cleveland—	
Direct-examination.....	1740

DEFENDANT'S EXHIBITS.

	Offered	Printed
Answer A. G. Co. in Helm Suit, Exhibit No. 18.....	1738	1901
Answer N. Y. Co. in Helm Suit, Exhibit No. 19.....	C. R.	1915
Auditor's Report to N. Y. Co. of July 12, 1892, Exhibit No. 10.....	1583	1761

XXXIV

	Offered	Printed
Balance Sheets N. Y. Co. (marked for identification).....	1619	1774
By-Laws of N. Y. Co., Exhibit No. 11.	1602	1776
Camp's Brief in N. E. Co. <i>vs.</i> A. G. Co., Exhibit No. 17.....		1883
Dawson Co. Suit Record, Exhibit No. 16	1733	1788
Extension Agreement, June 13, 1889, The N. Y. Co. (same as Compl'ts Exhibit No. 47), Exhibit No. 2.....	1431	C.R.252
Extension Agreement, June 23, 1890, Metropolitan Co. (same as Compl'ts Exhibit No. 51), Exhibit No. 3.....	1433	C.R.282
Journal 1, N. A. P. Co., Pages 68-69, Exhibit No. 15.....	1679	1787
Ledger 1, N. A. P. Co., Page 1, Exhibit No. 12.....	1679	1784
Ledger A, N. A. P. Co., Page 392, Exhibit No. 13.....	1679	1785
Ledger A, N. A. P. Co., Page 241, Exhibit No. 14.....	1679	1786
Letter Oct. 3, 1894, N. Y. Co. to Central Trust Co., Exhibit No. 4.....	1486	1486
Letter June 4, 1902, N. Y. Co. to Central Trust Co., Exhibit No. 5.....	1436	
(Printed in Compl'ts Record following x-Q. 348, Deposition of Haines).		
Letter June 20, 1902, N. Y. Co. to Central Trust Co., Exhibit No. 5½.....	1436	1436
Letter June 18, 1903, N. Y. Co. to Central Trust Co., Exhibit No. 6.....	1437	1437
Letter Oct. 3, 1894, N. Y. Co. to Winslow, Lanier & Co., Exhibit No. 9....	1483	1484
Stock Certificate, Metropolitan Co., No. B 125 to Central Trust Co. for 2,500 shares, Exhibit No. 7.....	1439	1439
Stock Certificate, The N. Y. Co., No. 55 to Central Trust Co. for 2,500 shares, Exhibit No. 8.....	1439	1440

PAPERS READ INTO TESTIMONY.

Letters.

	PAGE
Andem to Powell, January 14, 1904.....	1684
N. Y. Co. to Hardin, September 25, 1894.....	1627
N. Y. Co. to Hardin, October 3, 1894.....	1625
N. Y. Co. to Edison, February 10, 1896...1459, 1556	
N. Y. Co. to Edison, February 21, 1896...1459, 1556	
Jessup to Dyer, March 15, 1898.....	1447
Dyer to Jessup, April 4, 1898.....	1454
Jessup to Dyer, April 5, 1898.....	1453
Dyer to Jessup, April 5, 1898.....	1454
Jessup to Dyer, April 19, 1898.....	1452
Dyer to Jessup, April 21, 1898.....	1449
Dyer to Jessup, April 23, 1898.....	1353, 1450

Minutes.

Meeting of December 10, 1890.....	1380, 1381
“ “ February 10, 1891.....	1381
“ “ November 4, 1891.....	1381, 1400
“ “ “ 19, 1891.....	1401
“ “ January 4, 1892.....	1354, 1355
“ “ May 26, 1892.....	1384, 1402
“ “ July 12, 1892.....	1402, 1630, 1634
“ “ “ 19, 1892.....	1632, 1637
“ “ August 29, 1892.....	1359, 1360
“ “ October 31, 1892.....	1403
“ “ November 9, 1892.....	1360
“ “ December 20, 1892.....	1360, 1403
“ “ February 17, 1893.....	1403
“ “ March 3, 1893.....	1385, 1386
“ “ November 16, 1894.....	1384
“ “ September 19, 1894.....	1627
“ “ November 16, 1894.....	1405
“ “ February 27, 1895.....	1405
“ “ “ 10, 1896.....	1393, 1894, 1587
“ “ May 14, 1896.....	1388
“ “ January 31, 1898.....	1363
“ “ May , 1898.....	1355
“ “ June 3, 1898.....	1353, 1354

XXXVI

	PAGE
Meeting of February 6, 1900.....	1425
“ “ September 21, 1900.....	1424, 1426
“ “ October 22, 1900...1361, 1369, 1427,	1429
“ “ November 11, 1900	1429, 1430
“ “ May 20, 1903.....	1378
Annual Meetings, 1889-1903.....	1423
Contract with Dealers proposed by N. Y. Co..	1604
Opinion, HAZEL, J.....	1924
Order to Show Cause.....	1944
Petition for rehearing	1946
Affidavit of William Fahnestock	1972
Affidavit of Hugh M. Funston.....	1973
Affidavit of James L. Andam.....	1975
Affidavit of Louis Hicks.....	1977
Opinion, HAZEL, J.....	1985
Decree.....	1994
Order staying Injunction	1998
Bond (\$10,000).....	2000
Petition of Appeal and Allowance.....	2006
Assignment of Errors.....	2009
Bond for Costs (\$250).....	2016
Citation.....	2021
Clerk's Certificate	2022

964 **Complainant's Exhibit 53, April 16,
1903, J. A. S., Ex'r.**

State of New York,
City and County of New York, } ss.:

We, Andrew L. Taylor of Brooklyn, Kings County, New York, Timothy Cornwell, of Brooklyn, Kings County, New York, and Victor E. Burke of the City and County of New York, being desirous of forming a corporation pursuant to and in conformity with the Act of the Legislature of the State of New York, entitled "An Act to authorize the formation of corporations for manufacturing
965 "mining, mechanical or chemical purposes," passed February 17th, 1848, and the various Acts of the said Legislature additional thereto and amendatory thereof, have associated ourselves together for the purposes aforesaid and in pursuance of the requirements of said Act, do make, sign and acknowledge this certificate, and do hereby certify as follows:

First. The corporate name of the said corporation shall be, Metropolitan Phonograph Company.

Second. The objects for which said company is to be formed are to manufacture and sell, lease or otherwise dispose of machines and appliances appurtenant to or connected with phonographs and
966 phonograph-graphophones and the operation thereof; to acquire licenses or territorial grants of exclusive rights, relating to phonographs, phonograph-graphophones and similar machines, appliances and inventions, and to manufacture or sell, lease or otherwise dispose of such machines and appliances under such licenses and grants.

Third. The amount of the Capital Stock of the said company shall be One million dollars (\$1,000,000).

Fourth. The number of shares of which the Cap-

ital stock of the said corporation shall consist shall 967
 be Ten thousand (10,000) of the par value of One
 hundred dollars (\$100) each.

Fifth. The term of existence of the said corpora-
 tion shall be Fifty years.

Sixth. The number of Trustees who shall man-
 age the affairs of the said corporation shall be three,
 and the names of such Trustees for the first year
 are Andrew L. Taylor, Timothy Cornwell and
 Victor E. Burke.

Seventh. The operations of the said corporation
 are to be carried on in the Town of Hempstead,
 Queens County, New York.

968

Andrew L. Taylor.
 Timothy Cornwell.
 Victor E. Burke.

State of New York. }
 City and County of New York. } ss.:

On this first day of October, A. D., 1888, before
 me personally appeared Andrew L. Taylor,
 Timothy Cornwell and Victor E. Burke, all to me
 known and known to me to be the individuals de-
 scribed in and who executed the foregoing certifi-
 cate, and they severally before me signed the said
 certificate and acknowledged to me that they ex-
 ecuted the same for the uses and purposes therein
 mentioned.

969

Richard E. O'Brien,
 Notary Public,
 Kings Co.

[SEAL.]

(Cert. filed in N. Y. Co.)

970 State of New York,
City and County of New York, } ss.:

I, James A. Flack, Clerk of the City and County of New York, and also Clerk of the Supreme Court for the said City and County, the same being a Court of Record, do hereby certify, that Richard E. O'Brien, has filed in the Clerk's Office of the County of New York, a certified copy of his appointment as notary public for the County of Kings with his autograph signature, and was at the time of taking the proof or acknowledgment of the annexed instrument, duly authorized to take the same. And further that I am well acquainted with the hand writing of such notary, and verily believe that the signature to the said certificate of proof or acknowledgment is genuine.

971

In testimony whereof, I have hereunto set my hand and affixed the seal of the said Court and County, the 1st day of Oct., 1888.

James A. Flack,
Clerk.

[SEAL.]

Queens County, }
Clerks Office, } ss.:

I, John H. Sutphin, Clerk of said County and of the Courts of Record therein held do hereby certify that I have compared the preceding instrument with the original thereof on file in my office and that the same is a true copy thereof and of the whole original.

972

Witness my hand as clerk and the seal of Queens County this 3rd day of Oct. 1888.

J. H. Sutphin.

[SEAL.]

Clerk.

(Endorsed:) Metropolitan Phonograph Company. Certificate of Incorporation. Tax for privilege of organization of this incorporation, \$1,250.00. Under Chapter 143, Laws of 1886. Paid to

State Treasurer before Filing. * State of New York, 973
Office of Secretary of State. Filed and Recorded
Oct. 4, 1888. Diedrich Willers, Deputy Secretary
of State.

State of New York, }
Office of the Secretary of State, } ss.:

I have compared the preceding with the original
Certificate of Incorporation of Metropolitan Phon
ograph Company, filed and recorded in this office
on the 4th day of October, 1888, and do hereby cer
tify the same to be a correct transcript therefrom
and the whole of said original.

Witness, my hand and the Seal of office of the 974
Secretary of State, at the City of Al
[SEAL.] bany, this fifth day of March, one
thousand nine hundred and three.

Horace G. Tennant,
Second Deputy Secretary of State.

**Complainant's Exhibit 54, April 16.
1903, J. A. S., Ex'r.**

Certificate of incorporation of The New York
Phonograph Company.

City and County of New York, }
State of New York, } ss.:

975

We, John P. Haines, John D. Cheever and Rich
ard Townley Haines, being desirous of forming a
company for the purpose of carrying on the busi
ness hereinafter mentioned, pursuant to and in
conformity with the provisions of an Act of the
Legislature of the State of New York, passed Feb
ruary 17th, 1848, entitled "An Act to authorize
the formation of corporations for manufacturing,
mining, mechanical or chemical purposes" and of
the several acts of the said Legislature supple
mentary thereto and amendatory thereof, have as-

976 sociated ourselves together for the purposes aforesaid, and in pursuance of the requirements of said acts, do make, sign and acknowledge this certificate and do hereby certify as follows:

First. The corporate name of the said company shall be "The New York Phonograph Company."

977 Second. The objects for which said company is to be formed are, to manufacture and sell, lease or otherwise dispose of machines and appliances appurtenant to or connected with phonographs and phonograph-graphophones and the operation thereof, to acquire licenses or territorial grants of exclusive rights relating to phonographs, phonograph-graphophones and similar machines, appliances and inventions, and to manufacture or sell, lease or otherwise dispose of such machines and appliances under such licenses and grants.

Third. The amount of the capital stock of the said company shall be One million two hundred and fifty thousand dollars (\$1,250,000).

Fourth. The number of shares of which the said capital stock shall consist shall be twelve thousand five hundred (12,500) of the par value of One hundred dollars (\$100) each.

978 Fifth. The term of the existence of said corporation shall be Fifty years.

Sixth. The number of trustees who shall manage the concerns of the said company shall be seven.

Seventh. The names of the Trustees who shall manage the concerns of said company for the first year are:

John P. Haines, of Toms River, New Jersey.

John D. Cheever, of the City of New York.

Richard Townley Haines, of the City of New York.

Noah Davis, of the City of New York.

579

William Fahnestock, of the City of New York.

W. Seward Webb, of the City of New York.

John L. Martin, of the City of New York.

a majority of whom are citizens and residents of the State of New York.

Eighth. The names of the town and county in which the operations of the said company are to be carried on are the City of Poughkeepsie in the County of Dutchess and State of New York.

In testimony whereof, we have hereunto set our hands at the City of New York on the Eighth day of February, in the year of our Lord One thousand eight hundred and eighty-nine.

980

Jno. P. Haines.

John D. Cheever.

Richard Townley Haines.

State of New York, }
City and County of New York, } ss.:

On this eighth day of February, A. D. 1889, before me personally came John P. Haines, John D. Cheever and Richard Townley Haines, to me personally known to be the individuals described in and who executed the foregoing certificate and severally acknowledged that they executed the same for the purposes therein mentioned.

981

A. H. Parkhurst,
Notary Public,
Kings Co.

Certif. filed N. Y. Co.

State of New York, }
City and County of New York, } ss.:

I, Edward F. Reilly, Clerk of the City and County of New York, and also Clerk of the Supreme Court, for the said City and County, the same being a Court of Record, do here-

982 by certify, that A. H. Parkhurst has filed in the Clerk's office of the County of New York, a certified copy of his appointment as notary public for the County of Kings with his autograph signature, and was at the time of taking the proof or acknowledgment of the annexed instrument, duly authorized to take the same. And further, that I am well acquainted with the handwriting of such notary, and verily believe the signature to the said certificate of proof or acknowledgment to be genuine.

In testimony whereof, I have hereunto set my hand and affixed the seal of the said Court and County, the 9th day of Feby., 1889.

983 (Seal.) Edward F. Reilly,
Clerk.

State of New York, }
County of Dutchess, } ss.:

I, Theo. A. Hoffman, Clerk of the said County and Clerk of the Supreme Court of said State for said County, do certify that I have compared the preceding with the original certificate of incorporation of The New York Phonograph Company on file in my office and that the same is a correct duplicate therefrom and of the whole of such original.

Endorsed: Filed and Recorded February 11th, 1889.

984 In witness whereof, I have hereunto subscribed my name and affixed my official seal this 11th day of February, 1889.

(Seal.) Theo. A. Hoffman,
Clerk.

(Endorsed:)

The New York Phonograph Company
Duplicate

Certificate of Incorporation
Tax for privilege of organization of this
Corporation \$1,562 50-100

Under Chapter 143, Laws of 1886. Paid to 985
State Treasurer before Filing.

State of New York

Office of Secretary of State.

Filed and Recorded Feb. 12, 1889.

Frederick Cook,
Secretary of State.

State of New York, }
Office of the Secretary of State, } ss.:

I have compared the preceding with the original
Certificate of Incorporation of "The New York
Phonograph Company," filed and recorded in this
office on the 12th day of February, 1889, and do 986
hereby certify the same to be a correct transcript
therefrom and the whole of said original.

Witness, my hand and the seal of office of the
Secretary of State, at the City of Al-
[SEAL.] bany, this fifth day of March, one thous-
and nine hundred and three.

Horace G. Tennant,
Second Deputy Secretary of State.

**Complainant's Exhibit 55, April 16,
1903, J. A. S., Ex'r.**

For Private Distribution. Preliminary Pros- 987
pectus of the Metropolitan Phonograph Company,
a corporation to be organized under authority of
the North American Phonograph Company and
Jesse H. Lippincott, sole licensee of the American
Graphophone Company. Preliminary Prospectus
of the Metropolitan Phonograph Co.

The Metropolitan Phonograph Company, now
being organized under the laws of the State of New
York, with a capital stock of one million dollars,
divided into ten thousand shares of one hundred
dollars each, under the authority of the North
American Phonograph Company, and of Jesse H.

988 Lippincottt, sole licensee of the American Graphophone Company, will be the exclusive licensee for the Counties of New York, Kings, Queens, Suffolk, Richmond and Westchester, in the State of New York, of all phonographic and phonograph-graphophone patents of Messrs. Edison, Tainter and Bell together with all improvements which may be made thereon by those inventors, or either of them, or which may be acquired or controlled by the North American Phonograph Company and Jesse H. Lippincott, sole licensee of the American Graphophone Company, during the period covered by the said exclusive license, namely, fifteen years.

989 It is proposed in this preliminary prospectus merely to outline:

First. The character of the phonograph and phonograph-graphophone in a general way.

Second. The special uses to which the instrument has been demonstrated to be applicable in a commercial sense only.

Third. The special advantages that will be derived by the Metropolitan Phonograph Company as exclusive licensee for the territory controlled by it.

990 Fourth. The probable amount of business that will accrue to the company, as evidenced from careful investigation both into the character of the invention as an article of commercial importance and into the reasonable needs for such an invention by the public at large as a factor in every-day business and social life.

To these statements are added a few endorsements from well known persons, into whose hands for experimental purposes phonograph-graphophones were placed, with a view of testing in all ways possible their commercial utility.

General Outline of the Phonograph and Phonograph-Graphophone. 991

Although some ten years have elapsed since Edison startled the world by inventing a machine that stored up sound and reproduced it at will, it is only within the past few months that this wonderful invention has been brought to such a degree of perfection as makes it of practical utility to the public at large. The original phonograph, while valuable as demonstrating the possibilities of human invention, and as opening up a field of research in acoustics previously unexplored, lacked the elements essential for practical use. The metallic and sometimes indistinct sound-waves that were emitted from the primitive tin foil, the lack of proper incidental mechanical appliances, the want of a suitable material for the impression plate, and numerous other defects, made the invention useful principally in the laboratory of the scientist, or in the museum of curiosities. 992

These early defects have at last been all overcome, and the perfected phonograph or phonograph-graphophone for the multitudinous purposes for which it can be used, is as practical as the typewriter or the telephone in their respective spheres. By it the slightest shades and variations of the human voice are registered and reproduced with absolute accuracy; music, whether vocal or instrumental, solo or multiple, in all its rhythm, melody and intonation, the lowest as well as the highest notes; in a word, all sounds, of every kind and character, may be treasured up in this extraordinary instrument and reproduced—not once, but thousands of times—and may be mechanically duplicated and multiplied to any extent. The utility of this marvelous invention at this early day can scarcely be estimated. The uses of an instrument with such manifold functions would seem to be circumscribed 993

- 994 only by the uses subserved by the property of sound itself.

How the Sound is Registered and Reproduced.

- 995 The perfected phonograph or phonograph-graphophone, in size, occupies less space than an ordinary typewriting machine, and is much less complicated. Indeed its simplicity, and the readiness with which it can be operated by a novice, are among its remarkable features. The foundation principle consists in the cutting of minute impressions upon the surface of a small wax cylinder by means of a tiny cutting instrument, actuated by sound-waves, and in these same minute impressions or punctures afterwards setting in vibration a small diaphragm attached to a delicate needle point that delves in and out of the myriads of minute impressions with inconceivable rapidity, as the wax cylinder is revolved beneath the needle point, with the latter slightly resting upon the waxen surface. The wax cylinder or impression plate is less than 6 inches in length, and is held in place by suitable mechanism.

- 996 The work of adjusting the recorder for registering is that of a moment, and the reproducer is as readily placed in position when it is sought to hear the registered sounds. The cylinder is made to revolve either by a treadle moved by the foot, after the style of a sewing machine, or by a small electric motor, as may be desired, the latter having for its motive power a small bichromate or other ordinary electric battery. A rubber tube, with glass or vulcanite ear pieces to enable the listener more distinctly to hear, completes the apparatus.

Practical Uses of the Phonograph or Phonograph-Graphophone.

While, as previously stated, it is too early to foretell all the uses and necessities to which the per-

fectured phonograph or phonograph-graphophone is 997
destined to be applied, sufficient tests have already
been made to warrant the assertion that for all the
purposes hereinafter enumerated, the phonograph
or phonograph-graphophone is unqualifiedly prac-
tical and eminently desirable, and in making these
statements there are not, as is too often the case
with new inventions, any reservations or qualifica-
tions, or any depending for their realization upon
expected improvements. Upon the authority of
scores of disinterested users who have subjected
the instruments to all varieties of tests, and upon
the certainty of operation which the machine itself
demonstrates, these statements are made. 998

In this respect the phonograph or phonograph-
graphophone present a departure widely different
from the other great inventions of the age, notably
the sewing machine, the reaper, the telegraph and
the telephone, all of which have been the subject
of constant improvement, until the samples of to-
day of each of these inventions present such radical
differences from the ones first put into practical
operation, as to be scarcely recognizable as being
of the same class. It is true that time may cheapen
the cost of production of the phonograph or phono-
graph-graphophone—may possibly make the mech-
anism more simple; but the phonographs or phono-
graph-graphophones now about to be put upon the 999
market are so accurate as to suggest a likeness be-
tween their fidelity in reproducing sound exactly
as uttered, and the fidelity with which the photo-
graphic camera reproduces the features of the
sitter. *

Takes the Place of Stenographers.

Obviously one of the first uses of the phonograph
or phonograph-graphophone is its use as a stenog-
rapher, for it presents numerous superior features
for that class of work. An expert stenographer,

- 1000 who is also a typewriter, commands from \$14 to \$20 per week, while expert typewriters alone are numerous at from \$8 to \$10 per week. Leaving out of consideration the superiority in absolute accuracy which the phonograph or phonograph-graphophone necessarily possesses over the stenographer in reproducing the words spoken into it, persons having employment for stenographers will appreciate the advantage of having a "mechanical stenographer" which neither wants lunch hours or holidays; which can work as easily in the dark as in the light; which is always on hand; which never interrupts the speaker nor loses a word; whose compensation is fixed once for all, and which never gets ill or weary. By the aid of a phonograph or phonograph-graphophone a person engaged in correspondence or literary work that makes a stenographer and typewriter necessary may, with the small rental charged for the phonograph or graphophone, added to the diminished wages of a typewriter operator, save from \$5 to \$8 per week.
- 1001

Utility for Ordinary Correspondence.

- 1002 As a time and labor saver, what the sewing machine is to the needle the phonograph and phonograph-graphophone are to the pen. The percentage of persons to whom writing is a task of much labor is very large, and the percentage of persons who are unable properly to express their thoughts through the medium of writing, and yet who fluently express the minutest shades of their meaning by words of mouth, is scarcely less. This is readily comprehended when one reflects that talking is natural—writing is artificial.

The most ignorant never hesitates to convey accurately his meaning when speaking face to face, while to write with accuracy and fluency requires previous training and education. Besides, even the

most scholarly and rapid writer cannot write one-tenth as rapidly as he can talk. 1003

The Voice as a Guide to the Meaning.

In addition to the advantages alluded to, the phonograph or phonograph-graphophone, by reproducing the exact tones of the speaker, enables the hearer more completely to understand the meaning. The pleasure at times derivable in listening to the voice of an absent loved one is denied in the cold characters of a letter.

The Phonograph or Phonograph-Graphophone as an Educator.

For educational purposes the phonograph or phonograph-graphophone is destined to prove an important factor in many ways. 1004

To teach correct pronunciation of either native or foreign languages, the phonograph or phonograph-graphophone will be invaluable as a supplement to a teacher or a book. Elocution, also, so far as modulation, tone and other qualities of the voice are concerned, can be easily taught through the medium of the phonograph or phonograph-graphophone.

A Boon for Commercial Travelers.

If a phonograph or phonograph-graphophone was placed in every prominent hotel in the country, as doubtless in time will be the case, commercial travelers could more readily, more thoroughly and more accurately, keep their principals at home apprized of their doings and the details of the conditions and peculiarities of the territory through which they travel. In many cases the writing of the daily letter is a source of greater concern to them than all the day's work. 1005

Stored-up Music and Elocution.

As a source of amusement, the phonograph or

- 1006 phonograph-graphophone will undoubtedly fill a large and profitable field.

For a few cents the possessor of a phonograph or phonograph-graphophone will be enabled to listen to songs by Patti and other celebrated artists as well as to the strains of the most distinguished European and American instrumentalists, and the recitations by renowned actors, which, being duplicated in enormous numbers, may thus be brought within the pecuniary reach of all. It can readily be appreciated how inestimable a benefit this application will be to the blind and the sick.

The Mechanical Uses for Toys, Clocks, Etc.

- 1007 An exceedingly important field for the phonograph and phonograph-graphophone lies in its application for toys, clocks, etc.

By ingenious modifications clocks will be arranged so as to speak the hour instead of striking it.

Children's toys will be made to speak, sing, laugh or cry. These are mere isolated illustrations of the multitudinous uses to which the invention may be applied.

Special Advantages Possessed by the Metropolitan Phonograph Company.

- 1008 The territory exclusively controlled by the Metropolitan Phonograph Company, it is needless to say, is the most important, for the amount of area of any in the United States.

The population of New York, Kings, Queens, Suffolk, Richmond and Westchester Counties, according to best estimates, is over 2,500,000, and the entire territory may readily be operated from one office situated in the City of New York, without the intervention of sub-agencies, thus keeping the expense of operating at the minimum. Moreover, even this statement of the population fails to convey the true value of the district controlled by this

company, it being readily understood that many more instruments *per capita* will be used in this district than in any other in the whole country. 1009

Under the contract between the Metropolitan Phonograph Company and the Parent Company, all machines with motors complete are to be supplied in perfect working order, guaranteed by the latter company. Cylinders will be furnished to the user for a few cents each, on which amount this company will receive twenty per cent. of the selling price. It is believed that the revenue from cylinders alone will largely exceed the net revenue received from the use of the machines. This belief is based upon numerous experiments heretofore made by users to whom machines were furnished for trial, but who were obliged to purchase the cylinders as they were needed. 1010

Freedom from Litigation.

A valuable feature of the invention lies in the fact that the phonograph or phonograph-graphophone, unlike most of the other great revolutionary inventions, is so radical a departure from everything that has gone before, that the patents covering it seem impregnable. The company and its licensees will, in consequence, doubtless be saved the oftentimes harrassing experience occasioned by infringers. In addition, the North American Phonograph Company and Jesse H. Lippincott, sole licensee of the American Graphophone Company, give a special guarantee of protection, and this they are enabled safely to do by reason of their controlling all the phonograph and phonograph-graphophone patents in the United States and Canada, not only those of Edison, but also those of Tainter and Bell. 1011

Absence of the Usual Obstacles to Profit.

In the case of the telegraph, telephone and elec-

1012 tric light, local companies are by no means assured of success by a franchise from the parent company vesting them with exclusive control in particular territory. The consents of municipal authorities to run wires and erect plants are indispensable. The phonographs or phonograph-graphophones being supplied by the parent company, there is eliminated the necessity of large outlays for extensive plants.

To carry on the phonograph and phonograph-graphophone business, there are no lines to erect, no apparatus to construct, no costly exchanges and circuits to keep up, no municipal franchises to be obtained, and no demonstration on a large scale to test the commercial value of the instrument, as is so often true of other inventions. The company has to do only with the individual user, and the rental is placed so low that the machine is brought within the reach of all. The rental to be charged to users is \$40 per year, one-half of which is paid to the parent company for furnishing the manufactured machines.

The following is believed to be a careful and conservative estimate of the probable business of the Metropolitan Phonograph Company:

1014

Phonographs or Phonograph-Graphophones.—When 10,000 instruments are placed at a net annual rental to the company of \$20 each, the amount will equal, annually\$200,000

1015

Cylinders.—Each instrument using an average of 30 cylinders per day, would equal 300,000 cylinders per day for 10,000 phonograph-graphophones, which, at a profit of 6-10 of a cent per cylinder (20 per cent. of selling price), would equal \$1,800 per day, or at 300 working days per year, annually.....\$540,000

Total income\$740,000

1016

Expense of conducting this business, including rents, taxes, salaries, repairs, advertising, canvassing, commissions, insurance, office expenses, etc., etc., per annum 75,000

Net profit per annum.....\$665,000

Which is net profit of over 66 per cent. upon the capital stock.

The foregoing estimates are made after careful consideration and numerous experiments, and are believed to be very conservative. To ascertain the number of cylinders likely to be used, in general practice, an experiment was made early in June of this year, of placing fifty phonograph-graphophones in the hands of stenographers. The users were not charged for the machines, but were to pay three cents each for the cylinders used.

1017

The result was, that for two months the average number of cylinders required was 100 per machine per day, or 5,000 cylinders per day for the fifty machines.

Testimonials.

The following are the testimonials referred to above.

From Hon. Robt. R. Hitt, Ex-Assistant Secretary of State and Representative in the 47th, 48th, 49th and 50th Congresses from the Sixth District of Illinois.

Washington, D. C., July 6, 1888.

1019

For about two months I have had a phonograph-graphophone, and have used it chiefly for correspondence, but also for urgent rapid composition, for a quickly-made accurate record. It is exceedingly convenient, always at hand, always absolutely accurate in its work, always waiting your time and never keeps you waiting. With it there is no need of keeping a clerk waiting for a visitor, or stopping a stenographer in his work. Like other members I employ a stenographic clerk, who comes at a stated time. The phonograph-graphophone does not require your attention at a stated time, but at midnight, or early morning, or any leisure interval it is there and will work as rapidly as you can talk. Besides it keeps a permanent record of everything that can be referred to whenever required. In fact the more one uses it the more numerous are its convenient services, and the more necessary it seems to a busy man.

1020

Robert R. Hitt.

From A. Johns, Esq., the well-known stenographer of Washington.

Washington, D. C., July 12, '88.

I commenced working with the phonograph-graphophone about the 1st of May, and since that time have dictated to it over five hundred cylinders, or the equivalent of at least 400,000 words, equal to a congressional document of about six hundred pages.

I have been enabled to do what I never formerly supposed I could do, and that is to dictate from my stenographic notes the very hardest matter I am ever called upon to deal with. My idea had been that very difficult work would have to be dictated in the old way slowly to a typewriter operator. From the very first, however, I have been dictating everything, hard and easy alike, to the phonograph-graphophone, and by far the greater portion has been tariff hearings before a Senate committee, principally in connection with the items embraced in the chemical schedule of the tariff. 1021

If I had to do without the phonograph-graphophone now I should certainly feel like changing my vocation. 1022

A. Johns, Stenographer.

From Hon. S. R. Peters, Representative in the 48th, 49th and 50th Congresses of the Seventh District of Kansas.

Washington, D. C., July 11, 1888.

I have been using the phonograph-graphophone for a month with great and increasing satisfaction. I dictate into it all my answers to correspondents as rapidly as I can utter them, much more rapidly than any office stenographer could take them down, and I also dictate much of the data which I use in debate on the floor of the House of Representatives. I consider the phonograph-graphophone a very useful as well as a very fascinating instrument. Among the many advantages are the following: 1023

First. I can dictate the answers to my letters as I read them, instead of having to go over them again when my stenographer arrives. Thus I save a great deal of time daily, not only by the high rate of speed at which I work, but also by avoiding the second handling of my letters.

Second. I can do my dictation at any hour that

- 1024 suits me, very early in the morning or very late at night, when I could not have the attendance of a stenographer.

Third. Any person, whether a stenographer or not, can transcribe the letters and prepare them for signature; so that the instrument makes me independent of stenographic aid, which is always costly and sometimes difficult to obtain.

Fourth. Another point is that original matter can be dictated in the dark, an advantage in hot weather or where the eyes are sensitive to gas light.

- 1025 Fifth. The record can be preserved and reproduced by myself or anybody else who can hear, at any distance of time, while shorthand notes could be translated only by the writer.

In short, I would part with my stenographer and typewriter before I would part with my phonograph-graphophone for the purpose of carrying on my correspondence alone, to say nothing of the other interesting uses of the instrument.

Yours truly,

S. R. Peters.

From E. D. Easton, Esq., official reporter of the Guiteau and Star Route trials and now employed in the House of Representatives.

- 1026 Washington, D. C., July 13, 1888.

I have been familiar with the phonograph-graphophone since April, 1887, when it was first brought out, and began its use in business as soon as I could obtain the first instrument.

Previously all my dictation had been done directly to typewriter operators. I now use the phonograph-graphophone for all my work, and it is as superior to the old method as is the locomotive to the stage coach. The speed of the dictation is only limited by ability to articulate distinctly, and often runs over two hundred words per minute.

The day the first phonograph-graphophone arrived, I dictated to it a deposition of about one thousand words. The transcriber who had never before attempted such work, wrote readily from the dictation of the instrument, and made only one mistake in the copy. We have now trained a number of operators and the transcripts are as accurate as those made by direct dictation. Patent arguments, full of technical and unusual terms, are as correctly reproduced as simpler matter. The phonograph-graphophone does more than its most enthusiastic friends promised for it. It not only saves the time of the stenographer, but, by enabling him to accomplish so much more work, it increases his ability to earn. I can turn out at least twice as much copy per day with the phonograph-graphophone as I ever could before.

1027

1028

Since June 11th I have been reporting debates in the House of Representatives, and used the phonograph-graphophone there constantly. My transcriber began with only half an hour's preparation and has achieved highly satisfactory results. He can now readily do what two shorthand amanuenses were before required to accomplish.

A delightful as well as time-saving use of the phonograph-graphophone is to talk your message, put a stamp on the talk and send it to your correspondent. During a recent visit to Chicago my communication with family, business associates and friends in Washington was entirely by voice. I sent and received cylinders every day. I now correspond in this way daily with my wife and family, who are away from Washington. Often the children, too small to write, send messages; as do friends who call and see the wonderful talking machine. Even the crying of the baby is at times reproduced so perfectly that tender-hearted hearers are inclined to take the cylinder from the machine and walk the

1029

1030 floor in an endeavor to soothe the little one; and when listening to familiar voices it is difficult to resist an inclination to respond, so naturally are the tones reproduced.

Edward D. Easton.

Complainant's Exhibits 56-71, April 18, 1903, J. A. S., Ex'r.

These exhibits are set out in the record as shown at XQ240, testimony of Haines.

1031 **Complainant's Exhibit 72, April 18, 1903, J. A. S., Ex'r.**

Complainant's Exhibit 72 is identical with Complainant's Exhibit 22, except that in Exhibit 72 the date at the beginning is left blank, as follows: "This agreement made this day of , 1893" and except that in Exhibit 72 the signatures appearing at the end of Exhibit 22 are omitted; and the words "and by John P. Haines" are omitted before "as the party of the second part therein" in paragraph "First"; and "appliances and" is omitted in paragraph "Third" between "supplies" and "attachments"; and "supplies" is omitted between "Phonographs" and "appliances" in paragraph "Third"; and the word "and" is used instead of "or" between "July" and "October" in paragraph "Fourth"; and "the territory covered by this agreement and in and throughout" is omitted before "the United States" in paragraph "Seventh."

1032

'Complainant's Exhibit No. 73, May 8, 1903, J. A. S., Ex'r.' 1033

Edison Phonograph Works

Orange, N. J., March 10th, 1896.

Messrs. Walcutt, Miller & Co.,
53 East 11th Street, N. Y.

Gentlemen:

We duly received your favor of Feb. 29th instructing us to cancel your order for eight (8) "M" Phonographs to be shipped to Philadelphia.

The demand upon us for supply material has been so great that our stock is practically exhausted. We were shut down taking our Inventory nearly all of last week, and as a result are somewhat behind in our orders. We do not expect to have any Automatics in stock in less than two (2) weeks time. 1034

"Regarding orders for material, the writer will have to discuss this matter with you before we can accept same, as there are certain legal complications which we are advised by Counsel are still in force and effect."

Yours very truly,
W. E. Gilmore,
General Manager. 1035

WEG/HBH.
W., M. & Co.

Complainant's Exhibit 74, of May 8, 1903, J. A. S., Ex'r.

Form Number 131.

May first, Nineteen hundred.
Corrected to Jan. 2, 1902.

Jobbers Agreement. Original. This copy to be signed and returned to The National Phonograph Company, New York Office, 135 Fifth avenue.

1036 In Consideration of the sale of Edison Phonographs, Records and Blanks to me (us) at a discount by The National Phonograph Company, and after carefully reading the terms and conditions, governing and controlling the sale of such apparatus, as explained in price list and terms of sale, dated May 1, 1900; *Form No. 130*.

I (We) hereby agree to conform with and adhere strictly to, and be bound by, the terms and conditions stipulated by The National Phonograph Company, in the price list and terms of sale, dated May 1, 1900, *Form No. 130*, in selling or offering for sale Edison Phonographs, Records or Blanks.

1037 I (We) further agree, in case I (we) violate, in whole or in part, the terms and conditions specified in said price list and terms of sale, or refuse to return, properly verified, the memorandum referring to credit (*Form No. 142*), to forfeit the additional discount which is offered in said memorandum.

Signed.....

Dated..... Street No.

Business..... City.....State.....

Duplicate. This copy ONLY to be retained by you.

1038 In Consideration of the sale of Edison Phonographs, Records and Blanks to me (us) at a discount by The National Phonograph Company, and after carefully reading the terms and conditions, governing and controlling the sale of such apparatus, as explained in price list and terms of sale, dated May 1, 1900; *Form No. 130*.

I (We) hereby agree to conform with and adhere strictly to, and be bound by, the terms and conditions stipulated by The National Phonograph Company, in the price list and terms of sale, dated May 1, 1900, *Form No. 130*, in selling or offering for sale Edison Phonographs, Records or Blanks.

I (We) further agree, in case I (we) violate, in whole or in part, the terms and conditions specified in said price list and terms of sale, or refuse to return, properly verified, the memorandum referring to credit (*Form No. 142*), to forfeit the additional discount which is offered in said memorandum.

Signed.....

Dated..... Street No.

Business..... City.....State.....

**"Complainant's Exhibit 75, of May 8,
1903, J. A. S., Ex'r."**

Form No. 130.

May 1, 1900.

Corrected to May 1, 1901.

Edison Phonographs, Records and Blanks.
Issued by National Phonograph Co., Orange, New
Jersey. New York office, 135 Fifth avenue; Chicago
office, 144 Wabash avenue; Foreign Dep't, 15 Cedar
street, New York.

List prices of Phonographs, Records and Blanks.

Spring Motor Types.

The Edison Gem.....	\$ 10.00
The Edison Standard	20.00
The Edison Home	30.00
The Edison Triumph	50.00
The Edison Concert	75.00

Electric Types.

The Edison Victor (Battery), ...	60.00
The Edison Conqueror (Direct Current),...	75.00
The Edison Opera (Concert, Battery), ...	85.00
The Edison Oratorio (Concert, Direct Current, ...	100.00

Coin Slot Types.

The Edison Bijou (Spring Motor), ...	30.00
The Edison Excelsior (Spring Motor), ...	50.00
The Edison Imperial (Battery), ...	125.00
The Edison Regal (Direct Current), ...	125.00
The Edison Climax (Concert, S. M.), ...	125.00
The Edison Ajax (Concert Battery), ...	150.00
The Edison Vulcan (Concert, Direct Cur- rent), ...	150.00

(For full description of above machines see our regular catalogue.)

Records.

1043 Edison Records (Standard size), ...\$.50 each
 \$5.00 per dozen.
 Edison Concert Records, ... 1.00 each
 \$12.00 per dozen.

Dealers' discount allowed from list price of single records only and not from list price per dozen.

Blanks.

Edison Blanks (rough), ...	\$.20 each
Edison Blanks (shaved), ...	.25 each
Edison Concert Blanks (shaved), ...	.85 each

1044 For Prices on Phonograph repair and supply parts, see Price List of Phonograph Parts. For horns, carrying cases, record cabinets and miscellaneous supplies, see regular catalogue and discount sheet.

Terms and conditions of sale. In effect May 1, 1900. Corrected to May 1, 1901.
Corrected to January 2, 1902.

Jobbers' Discounts.

1045

All Phonographs except Gem

and Bijou, ...	50	per cent. off list.
Gem and Bijou Phonographs, 40	"	"
Records (Standard size), ... 60	"	"
Records (Concert size), ... 50	"	"
Blanks (Standard size), ... 55	"	"
Blanks (Concert size), ... 55	"	"

Cash discount: On invoices paid within 10 days from date, 2 per cent.

Terms: Net 30 days.

Delivery: If shipment made from factory, Orange, N. J., F. O. B. City in which jobber is located, if east of Mississippi River, if west of the Mississippi, a freight allowance of 75 cents per 100 lbs. If shipment made from Chicago office, delivery F. O. B. Chicago, Ill. 1046

Conditions of Sale.

All Edison Phonographs, Records and Blanks are sold at Orange, New Jersey, under the license of the Edison Phonograph Company, subject to the following conditions:

No. 1. Jobbers must not sell or offer for sale at wholesale Edison Phonographs, Records or Blanks at better discounts than authorized or instructed by the National Phonograph Company, nor can they allow any discount whatever from published list prices, either directly or indirectly, to any person or persons who have not an established place of business; or, having such, will not purchase at least three machines, each of different style and one barrel or 150 Records, to establish them as a dealer or dealers. 1047

No. 2. Jobbers must not sell or offer for sale at retail Edison Phonographs, Records or Blanks at

- 1048 less than list prices as published by the National Phonograph Company, nor will they be allowed to include with a machine at list price, any extra material or supplies not listed to go with same as a regular outfit.

No. 3. Giving away or selling other goods at less than regular prices, in order to induce the sale of Edison Phonographs and Records, will be considered contrary to the conditions hereof.

No. 4. Placing Edison Phonographs and Records on consignment, or for sale, except with established dealers as heretofore stated, will not be allowed.

- 1049 No. 5. Jobbers must not sell or supply, either directly or indirectly Edison Phonographs or parts thereof, Records or Blanks to any dealer who will not sign the Agreement governing and controlling the sale of same, nor to dealers who are on our suspended list.

- 1050 No. 6. All Edison Phonographs bear a serial number; all Edison Records are boxed and ticketed with copyright and registered tickets and labels, and any jobber or retail dealer buying, selling or offering for sale an Edison Phonograph with the serial number erased or defaced, or an Edison Record without the copyright and registered label or ticket, infringes the patents under which such Phonographs and Records are sold, and will be considered as having violated his Agreement.

No. 7. Exchanging Edison Phonographs, Records or Blanks in whole or part payment for advertising privileges, or for goods of some other make or nature; or the acceptance of goods or merchandise of other make or nature in whole or part payment for Edison Phonographs, Records or Blanks, is contrary to the conditions hereof. This does not prohibit the acceptance of a talking machine at

full list price, if good as new (or less cost of necessary repairs to make good as new) in exchange for an Edison Phonograph sold at full retail list price; or the acceptance of records at not to exceed the list price of rough blanks in exchange for Edison Records sold at full retail list price; the exchange of Edison Phonographs or Edison Records being subject to conditions stated in Paragraph No. 8. 1051

No. 8. The selling or offering for sale, of Edison Phonographs, Records or Blanks, that have become shop-worn, or have been taken in exchange, as second-hand machines, Records or Blanks at reduced prices, will be considered a cutting of prices and will not be allowed. This does not prohibit the shaving of old records and selling them as, and at the prices of shaved Blanks. 1052

No. 9. Jobbers are to furnish the National Phonograph Company with a list of all dealers to whom they are now selling Edison Phonographs, Records or Blanks, and must advise the National Phonograph Company promptly of any and all new dealers established, together with copy of Agreement properly signed by such dealer or dealers.

No. 10. Exchange between jobbers. Authorized jobbers will in case of emergency or necessity, be allowed to borrow from any other authorized jobber, provided the goods so borrowed are actually replaced with goods of the same style and make. In case a sale takes place between two jobbers, it must be at the discount allowed retail dealers and not at Jobber's discount. 1053

No. 11. All Edison Phonographs, Records and Blanks are covered by United States patents and are sold under the condition that the license to use and vend them implied from such sale is dependent on the observance by the vendee of all the foregoing conditions; upon the breach of any of said condi-

1054 tions, the license to use or vend said phonographs, records and blanks immediately ceases and any vender or user thereafter becomes an infringer of said patents and may be proceeded against by suit for injunction or damages, or both.

Conditional Credit Memorandum.—On or about the 15th of each month, a memorandum will be sent each Jobber showing the total number of Phonographs, Records and Blanks purchased by you during the previous month. If this memorandum is returned at the time indicated thereon, properly signed and verified to the satisfaction of this Company, a credit of 10 per cent. from list price on such Phonographs, Records and Blanks will be allowed the dealer so returning same.

(Note: This paragraph is cancelled on the original exhibit by lines drawn through the words).

The discounts first mentioned represent the full Jobbers' discounts, but an extra credit as above stated is offered as a special consideration for advantages accruing to us through having our specialties sold at a price that affords the dealer a profit large enough to warrant his energetically and exclusively pushing their sale, and complying with the other conditions of sale, herein mentioned.

1056 This credit will not, under any circumstances, be allowed where the terms and conditions of sale are not strictly complied with.

(Note: This paragraph is cancelled on the original exhibit by lines drawn through the words).

National Phonograph Company,
Orange, New Jersey,

New York Office, 135 Fifth Avenue.

Chicago Office, 144 Wabash Avenue.

Foreign Department, 15 Cedar St., New York.

Corrected to Jan. 2, 1902.

"Complainant's Exhibit 76, May 8, 1903, J. A. S., Ex'r." 1057

Notice is hereby given to you:

That every Edison Phonograph has on it a special serial number. These phonographs are sold to the public by the National Phonograph Company under licenses from the Edison Phonograph Company and Thomas A. Edison, with the express condition that the said machines, whether sold directly by the National Phonograph Company or indirectly by selling agents, jobbers or dealers, are licensed to be used or vended only so long as said serial number, wherever it appears on said machine, is not removed or changed in whole or in part. The license to use or vend the said machines implied from the sale thereof terminates immediately on such serial number being removed or changed in whole or in part, and any sale or use of such machines after such number shall have been so removed or changed, will subject such seller or user to a suit for infringing the patents covering said machines.

1058

National Phonograph Company

Orange, N. J.

New York Office, 135 Fifth Avenue.

"Complainant's Exhibit 77, of May 8, 1903, J. A. S., Ex'r." 1059

National Phonograph Co., Edison Laboratory, Orange, N. J. Office and Salesroom, 135 Fifth Avenue, Corner of 20th street. Address all Communications to the Company to New York.

New York, January 15, 1900.

In replying to this letter C. H. W. please mention these initials.

List of Suspended Dealers superseding all previous lists.

1060 F. M. Prescott, 44 Broad street, New York, N. Y.

Columbia Phonograph Co., or branch offices either in New York City or elsewhere.

Samuel Nafew Co., 392 Broadway, New York, N. Y., also 16 Dearborn St., Chicago Ill.

Eagle Phonograph Co., or C. Lowenthal 83 Nassau Street, New York, N. Y.

Empire Phonograph Company, 2 West 14th St., New York, N. Y.

Union Office Supply Co., 83 Nassau St., New York, N. Y.

1061 Willis Park Row Bicycle Co., 23 Park Row, New York, N. Y.

Siegel Cooper Co., New York, N. Y., also Chicago, Ill.

R. H. Macy & Co., New York, N. Y.

W. T. Hunt, 121 World Building, New York N. Y.

S. Lemberg & Co., 194 Broadway, New York, N. Y.

A. T. Armstrong, or American Phonograph Co., 106 Wall street, New York, N. Y.

Hawthorne & Sheble, 43 Broad St., New York, N. Y., also Philadelphia, Pa.

John Wanamaker, New York, N. Y., also Philadelphia, Pa.

1062 *Imperial Sporting Goods Co. 40 Cortlandt St., New York, N. Y.

Jacob Popp, Brockport, N. Y.

Brooklyn Phonograph Co., 573 Fulton St., Brooklyn, N. Y.

Wm. Staats, 499 Flushing avenue, Brooklyn, N. Y.

A. D. Matthews & Son, Fulton St., Brooklyn, N. Y.

F. P. Moore, Providence, R. I.

The Arcade Co, Providence, R. I.

Williams & Rankin, Providence, R. I.

Allen Co., Providence, R. I.

- The Shepard Company, Providence, R. I. 1063
 Neil McLennon, 196 Thomas St., Newport, R. I.
 Sawyer Dry Goods Co, Hartford, Conn.
 The Foster Co., Fall River, Mass.
 Hawthorne & Sheble, 604 Chestnut St., Philadelphia, Penn.
 Escher's Music Store, 1242 Grand Ave, Philadelphia, Penn.
 *John Wanamaker, Philadelphia, Penn.
 *Weygandt & Co., 914 Arch street, Philadelphia, Penn.
 Robert Williams, Turtle Creek, Penn.
 Kaufman Bros., Pittsburg, Penn.
 Scranton Novelty Co., K. A. Weichell, Scranton, Penn. 1064
 Keller's Music House, (W. H. Kellar), Easton, Penn.
 John McWilliams, Wilkensburg, Pa., also Wilmerding, Pa.
 Imperial Phonograph Co., 870 Broad St., Newark, N. J.
 Chas H. Kelly, 25 N. Main St., Paterson, N. J.
 *J. L. Andem or Edison Phonograph Co., Cincinnati, Ohio.
 Samuel Nafew Co., 167 Dearborn St., Chicago, Ill.
 Siegel Cooper Co., Chicago, Ill.
 Philip Kalt, 445 East Water Street, Milwaukee, Wis. 1065

We ask you to co-operate with us, for our mutual good, by refusing to supply any of these dealers with our apparatus.

Kindly acknowledge receipt of this list. This we ask particularly, as we wish positive information that it has been received by you. Your

- 1066 acknowledgment will assure us that you intend to co-operate with us fully.

National Phonograph Co.,
C. H. Wilson, Manager of Sales.

Names marked with a * have been added to suspended list since Dec. 9, 1899.

"Complainant's Exhibit 78, of May 8, 1903, J. A. S., Ex'r."

Address your reply to this communication to New York, N. Y.

- 1067 W. E. Gilmore, President & General Manager.
J. F. Randolph, Secretary & Treasurer.
National Phonograph Co., Edison Laboratory,
Orange, N. J. New York office, 135 Fifth avenue;
Chicago office, 144 Wabash avenue; Foreign Department, 15 Cedar St., New York.

New York, February 10, 1902.

135 Fifth Ave. Telephone Call, 2276-18th.

In reply to this letter

Please mention these initials.

List of suspended dealers—superseding all previous lists:

- 1068 F. M. Prescott, 44 Broad street, New York, N. Y.
Columbia Phonograph Co., or branch offices either in New York City or elsewhere.
Sam'l Nafew Co., 393 Broadway, New York, N. Y., also 167 Dearborn street, Chicago, Ill.
Eagle Phonograph Co., or C. Lowenthal, 83 Nassau street, New York, N. Y.
Empire Phonograph Co., 2 West 14th street, New York, N. Y.
Union Office Supply Co., 83 Nassau St., New York, N. Y.
Willis Park Row Bicycle Co., 23 Park Row, New York, N. Y.
R. H. Macy & Co., New York, N. Y.

W. T. Hunt, 121 World Building, New York, 1069
N. Y.

S. Lemberg & Co., 194 Broadway, New York,
N. Y.

A. T. Armstrong, or American Phonograph Co.,
106 Wall street, New York, N. Y.

Hawthorne & Sheble, 297 Broadway, New York,
N. Y., also Philadelphia. Pa.

John Wanamaker, New York, N. Y.

R. L. Corwin, New York, N. Y., also Newark,
N. J.

W. L. Isaacs, 114 Fulton Street, New York, N. Y.

J. McEllynn, 202 Broadway, New York, N. Y.

R. H. Ingersoll & Bro., 67 Cortlandt St., New 1070
York, N. Y.

M. Newgold, 8 Cortlandt street, New York, N. Y.

Brooklyn Phonograph Co., 573 Fulton street,
Brooklyn.

Henry Batterman & Co., Graham and Flushing
Avenues, Brooklyn.

Broadway Cycle Co., 210 Broadway, Brooklyn.

F. W. Austin & Co., Gloversville.

H. H. Higley, Norwich.

F. P. Moore, Providence, R. I.

Williams & Rankin, Providence, R. I.

Neil McLennon, Newport, R. I.

Sawyer Dry Goods Co., Hartford, Conn.

1071

Lord & Co., 314 Essex Street, Lawrence, Mass.

A. T. Fuller, Malden, Mass.

H. B. DeWolff, New Bedford, Mass.

Hawthorne & Sheble, 604 Chestnut St., Phila-
delphia, Penn.

Escher's Music Store, 1242 Girard Ave., Phila-
delphia, Penn.

Weygandt & Co., 914 Arch street, Philadelphia,
Penn.

Robert Williams, Turtle Creek, Penn.

Kaufmann Bros., Pittsburg, Penn.

- 1072 E. P. Murphy, McKeesport, Penn.
Scranton Novelty Co., Scranton, Penn.
K. A. Weichell, Scranton, Penn.
Keller's Music House (W. H. Keller), Easton,
Penn.
John McWilliams, Wilkensburg, Pa., also Wil-
merding, Pa.
W. L. Hoffman, 151 Montgomery St., Jersey City,
N. J.
Imperial Phonograph Co., 870 Broad street, New-
ark, N. J.
F. W. Leporin, 194 Market street, Newark, N. J.
Standard Phonograph Co., Newark, N. J.
- 1073 Hubert Butterworth, 503 Market street, Newark,
N. J.
H. V. Butterworth, 503 Market St., Newark,
N. J.
R. L. Corwin, Newark, N. J.
Chas. H. Kelly, 25 N. Main street, Paterson, N. J.
J. L. Andem, Cincinnati, Ohio.
Samuel Nafew Co., 167 Dearborn street, Chicago,
Ill.
F. J. Schwankovsky, Detroit, Mich.
Geo. W. Emendorfer, Saginaw, Mich.
Philip Kalt, 445 East Water street, Milwaukee,
Wis.
- 1074 Crahan M'f'g Co., Seattle, Wash.

We ask you to co-operate with us, for our mutual
good, by refusing to supply any of these dealers with
our apparatus.

Kindly acknowledge receipt of this list. This
we ask particularly, as we wish positive informa-
tion that it has been received by you. Your acknowl-
edgment will assure us that you intend to co-oper-
ate with us fully.

National Phonograph Company.

C. H. Wilson, Manager of Sales.

Last list was No. 289—December 1, 1901.

**"Complainant's Exhibit 79, May 8, 1075
1903, J. A. S., Ex'r."**

Agreement.

National Phonograph Co., Edison Laboratory,
Orange, N. J. Office and salesroom, St. James
Building, Broadway and 20th Street, New York.

Address all communications to the Company to
New York.

In replying to this letter

Please mention these initials.

New York, March 25, 1899.

In consideration of the sale of Edison Phono-
graphs and Edison Records to us by the National 1076
Phonograph Co.,

We hereby agree that we will not wholesale Edi-
son Phonographs or Edison Records at a better dis-
count than authorized or instructed by the National
Phonograph Co., nor will we give better delivery
than f. o. b. our place of business; that we will give
no discount whatever from published list prices to
anybody, either directly or indirectly, who is not
a dealer entitled to regular discounts; that we will
not retail Edison Phonographs or Records at less
than the published list price, nor will we include
with a machine at list price any extra material or
supplies not listed to go with regular outfits by the 1077
National Phonograph Co.

We further agree that we will not supply, either
directly or indirectly, Edison Phonographs or Edi-
son Records to dealers who do not adhere to above
agreement, nor to dealers who are on your "sus-
pended list."

Sign here

We send you this agreement in duplicate. Please
sign and return one and keep the duplicate for ref-
erence.

**1078 Complainant's Exhibit 80, of May 8th,
1903, J. A. S., Ex'r.**

National Phonograph Co., Edison Laboratory,
Orange, N. J. Office and salesroom, St. James
Building, Broadway and 26th street, New York.

Address all communications to our New York
office.

New York, May 2nd, 1898.

To the Trade:

1079 Our attention has been called by a number of our
customers to certain circulars distributed by a
competitor, warning users and agents against
handling infringing talking machines, blanks and
records. In order that all persons and concerns
handling our goods may understand the situation
thoroughly, we desire to say that there is no ques-
tion, so far as we are aware, as to the entire free-
dom of any one, whether user or agent, to handle
our output, nor is it the purpose of the circular re-
ferred to, to warn any one against the use or sale of
our goods.

1080 The National Phonograph Company stands be-
hind every dollar's worth of apparatus which it
sells and will hold every dealer in or user of that
apparatus absolutely harmless. This has always
been our attitude and our success has convinced
us of its wisdom.

We take advantage of this opportunity to again
warn all persons and concerns against infringement
of Mr. Edison's patents under which we manu-
facture. Violations of those patents will be prose-
cuted vigorously.

Respectfully,

National Phonograph Co.,

By W. E. Gilmore,

General Manager.

**Complainant's Exhibit 81, May 8, 1081
1903, J. A. S., Ex'r.**

National Phonograph Co., Edison Laboratory,
Orange, N. J. Office and salesroom, St. James
Building, Broadway and 26th street, New York.

Circular Letter.

Orange, N. J., April 1st, 1898.

To our Patrons:

We have received frequent demands from our customers requesting that we supply our Phonographs equipped with Automatic Reproducers instead of the Standard Speakers. This has led us to the conclusion that the trade in general prefer machines so equipped. 1082

We have therefore decided that on and after April 10th, 1898, we will equip all our Phonographs with Automatic Reproducers instead of the Standard Speakers. However, we leave it optional with the customer, and will supply the Standard Speaker if so desired. Orders, however, should plainly specify where Standard Speakers are desired, otherwise the machines will be shipped equipped with the Automatic Reproducers, as stated above.

The price of the Standard Speaker is reduced from \$7.50 to \$5, thus not increasing the cost of the complete apparatus. 1033

For reproducing only, we recommend the Automatic Reproducer as being superior to the Standard Speaker. For the information of those not acquainted with either, a brief description follows:

The Automatic Reproducer, as its name implies, is made for reproducing purposes only. It has no recording sapphire, nor can one be attached to it. It does away with the use of the speaker adjusting screw, as it is so constructed that it always tracks the thread of the record, overcoming the expansion and contraction of the wax cylinder in different

1084 temperatures. When the track is once found the reproducing ball adjusts itself automatically, and the reproduction is clearer and louder.

The Standard Speaker is a combination recording and reproducing device, being equipped with two sapphires, one for recording and the other for reproducing. It was designed for recording and instant reproduction, thus obviating the necessity of change of speakers. In combining these qualities, it was necessary to design and construct it with rigid weights. Owing to its rigid character, and the unequal expansion and contraction of the wax cylinder, the reproducer sometimes loses the track of the record, and requires to be adjusted by the use of the speaker adjusting screw.

We wish to state that we are also prepared to supply Edison Recorders or Speakers with recording sapphire only. Price \$5. Selection can therefore be made from the three types as follows:

The Edison Standard Recorder and Reproducer.

The Edison Automatic Reproducer.

The Edison Recorder.

Yours truly,

National Phonograph Company.

1086 **Complainant's Exhibit 82, May 13,
1903, J. A. S., Ex'r.**

Edison Phonograph Works.

Orange, N. J., March 26th, 1896.

E. F. Leeds, Esq.,

c/o Messrs. Walcutt & Leeds.

53 East 11th St., N. Y.,

Dear Sir:

I have your letter of the 24th, instructing us to cancel any orders we may have on our books in the name of Mr. Miller. I shall not be here to-

morrow, and would ask that you defer your visit until next week. 1087

Yours very truly,

W. E. Gilmore,
General Manager.

WEG/HBH.

**Complainant's Exhibit 83, May 13,
1903, J. A. S., Ex'r.**

Address your reply to this communication to New York, N. Y.

W. E. Gilmore, President & General Manager.

J. F. Randolph, Secretary & Treasurer.

1088

National Phonograph Co., Edison Laboratory, Orange, N. J. New York office, 83 Chambers street; Foreign Department, 83 Chambers street; Chicago office, 144 Wabash avenue; San Francisco office, 933 Market street.

In reply to this letter,
Please mention these initials.

New York, March 4, 1903.

To the Trade:

In our suit against the Lambert Company for infringement of our patent rights, the U. S. Circuit Court at Chicago has just decided that the Edison patent covering the tapering-bore phonograph-record is a valid patent, and that it is infringed by the Lambert record. The following statements are taken from the opinion of the Court:

1089

"The complainants have made considerable improvements, both novel and useful, which are entitled to a generous construction. The first question presented is whether defendants' record or phonogram is an infringement of claims 1 and 2 of complainants' patent No.

1090

382,418 for a phonogram having a bore tapered throughout its length. Or, in other words, is defendants' phonogram or record, with its end flanges varying in depth to engage a tapered mandrel at each end of the record, an equivalent of complainants' tapered bore?"

1091

"Defendants' device is of material rigid and strong enough to effect this result with no other than end frictional engagements with the mandrel. Defendants claim that their record may be used upon a stepped mandrel just as well. In my judgment this would not alter the character of the device. Complainant was the first to establish frictional engagement of the record with the mandrel *at both ends, as well as throughout its length*. I am further of the opinion from the record that the defendants' device, with its end flanges varying in depth to engage a tapering mandrel, is an infringement of claims 1 and 2 of complainants' said patent No. 382,418, and that as to such infringement complainant is entitled to the injunction prayed."

1092

A decree has been entered, awarding the complainant profits and damages, and also an injunction against the Lambert Company. As is usual in such cases, the Lambert Company has taken an appeal, and has secured a suspension of the injunction until the appeal is decided, but we have every reason to believe that the favorable decision of the Circuit Court will not be disturbed.

We hereby notify all dealers that the selling of the Lambert records provided with end flanges varying in depth to engage a tapering mandrel is an act of infringement for which we will hold them liable, and that we propose to enforce our rights, which have now

been acknowledged by the Courts, by bringing suits 1093
against dealers handling such Lambert records.

W. E. Gilmore,
President.

**Complainant's Exhibits 84-85, May 13,
1903, J. A. S., Ex'r.**

These two exhibits are set out in the record at
Q. 293, testimony of Gilmore.

**Complainant's Exhibit 86, May 13,
1903, J. A. S., Ex'r.**

Form Number 141N. May first, Nineteen hundred. 1094
Corrected to Jan. 2, 1902.

Retail Dealers' Agreement.

Original.

This copy to be signed and returned to The Na-
tional Phonograph Company, Orange, N. J.

In consideration of the sale of Edison Phono-
graphs, Records and Blanks to (me) (us) at a dis-
count by The National Phonograph Company, and
after carefully reading the terms and conditions,
governing and controlling the sale of such appar-
atus, as explained in price list and terms of sale,
dated May 1, 1900; *Form No. 140N*

1095

(I) (We) hereby agree to conform with and ad-
here strictly to, and be bound by, the terms and
conditions stipulated by The National Phonograph
Company, in the price list and terms of sale, dated
May 1, 1900, *Form No. 140 N*, in selling or offering
for sale Edison Phonographs, Records or Blanks.

I (We) further agree, in case I (we) violate, in
whole or in part, the terms and conditions specified
in said price list and terms of sale, or refuse to
return, properly verified, the memorandum re-

- 1096 ferring to credit (*Form No. 142*), to forfeit the additional discount which is offered in said memorandum.

Signed.....

Business..... City.....State.....

Dated..... Street No.

[Note.: This paragraph is cancelled in the original exhibit.]

Duplicate.

This copy only to be retained by you.

- 1097 In consideration of the sale of Edison Phonographs, Records and Blanks to (me) (us) at a discount by The National Phonograph Company, and after carefully reading the terms and conditions, governing and controlling the sale of such apparatus, as explained in price list and terms of sale, dated May 1, 1900; *Form No. 140 N*

(I) (We) hereby agree to conform with and adhere strictly to, and be bound by, the terms and conditions stipulated by *Form No. 140 N*, The National Phonograph Company, in the price list and terms of sale, dated May 1, 1900, in selling or offering for sale Edison Phonographs, Records or Blanks.

- 1098 I (We) further agree, in case I (we) violate, in whole or in part, the terms and conditions specified in said price list and terms of sale, or refuse to return, properly verified, the memorandum referring to credit (*Form No. 142*), to forfeit the additional discount which is offered in said memorandum.

Signed.....

Business..... City.....State.....

Dated..... Street No.

[Note.: This paragraph is cancelled in the original exhibit.]

Complainant's Exhibit 87, May 13, 1099
1903, J. A. S., Ex'r.

Form. No. 140 N.

May 1, 1900.

Corrected to May 1, 1901.

Retail dealers' price list, discounts and terms of sale, Edison Phonographs, Records and Blanks. Issued by National Phonograph Co., Orange, New Jersey. New York office, 135 Fifth avenue; Chicago office, 144 Wabash avenue; Foreign Dep't, 15 Cedar street, New York.

List prices of Phonographs, Records and Blanks.

Spring Motor Types.

The Edison Gem, ...	\$ 10.00	1100
The Edison Standard, ...	20.00	
The Edison Home, ...	30.00	
The Edison Triumph, ...	50.00	
The Edison Concert, ...	75.00	

Electric Types.

The Edison Victor (Battery), ...	60.00	
The Edison Conqueror (Direct Current), .	75.00	
The Edison Opera (Concert, Battery), ...	85.00	
The Edison Oratorio (Concert, Direct Current), ...	100.00	

Coin Slot Types.

The Edison Bijou (Spring Motor), ...	30.00	
The Edison Excelsior (Spring Motor), ...	50.00	1101
The Edison Imperial (Battery), ...	125.00	
The Edison Regal (Direct Current), ...	125.00	
The Edison Climax (Concert, S. M.), ...	125.00	
The Edison Ajax (Concert Battery), ...	150.00	
The Edison Vulcan (Concert, Direct Current), ...	150.00	

(For full description of above machines see our regular catalogue.)

1102

Records.

Edison Records (Standard size), ...\$.50 each
\$5.00 per dozen.

Edison Concert Records, ... 1.00 each
\$12.00 per dozen.

Dealers' discount allowed from list price of
single records and not from list price per dozen.

Blanks.

Edison Blanks (rough), ...\$.20 each

Edison Blanks (shaved), ...25 each

Edison Concert Blanks (shaved), ...85 each

1103 For prices on Phonograph repair and supply
parts, see Price List of Phonograph Parts. For
horns, carrying cases, record cabinets and misce-
laneous supplies, see regular catalogue and dis-
count sheet.

Any dealer desiring to handle our apparatus, who
has never handled talking machines, must place an
initial order of at least three machines, each of a
different style, and one barrel (150) records. In
addition, he must have an established place of busi-
ness, suitable to display and handle our goods.

Terms and Conditions of Sale.

In effect May 1, 1900. Corrected to Jan. 2, 1902.
("May 1, 1901" is cancelled in original exhibit.)

1104 Retail Dealers' Discounts:

All Phonographs except Gem

and Bijou, ... 40 per cent. off list.

Gem and Bijou Phonographs, 30 " " "

Records (Standard size), .. 50 " " "

Records (Concert size), ... 40 " " "

Blanks (Standard size), ... 50 " " "

Blanks (Concert size), ... 50 " " "

Cash discount: On invoices paid within 10 days,
2 per cent.

Terms: Net 30 days.

Delivery:

Conditions of Sale.

1105

All Edison Phonographs, Records and Blanks are sold at Orange, New Jersey, under the license of the Edison Phonograph Company, subject to the following conditions:

No. 1. Retail dealers must not sell or offer for sale, either directly or indirectly, Edison Phonographs, Records or Blanks at a discount, or less than the list prices quoted herein, nor will they be allowed to include with a machine at list price any extra material or supplies, not listed to go with the same as a regular outfit.

No. 2. Giving away or selling other goods at less than regular prices, in order to induce the sale of Edison Phonographs and Records, will be considered contrary to the conditions hereof. 1106

No. 3. Any dealer selling or supplying in any way either directly or indirectly, Edison Phonographs or parts thereof, Records or Blanks, to a dealer or party whose name appears on our suspended list, violates his or their Agreement, and place themselves in the position of being at once cut off from any further supply of goods.

No. 4. All Edison Phonographs bear a serial number; all Edison Records are boxed and ticketed with copyright and registered tickets and labels, and any jobber or retail dealer buying, selling or offering for sale an Edison Phonograph with the serial number erased or defaced, or an Edison Record without the copyright and registered label or ticket, infringes the patents under which such Phonographs and Records are sold, and will be considered as having violated his Agreement. 1107

No. 5. Exchanging Edison Phonographs, Records or Blanks in whole or part payment for advertising privileges, or for goods of some other make or nature, or the acceptance of goods or merchandise of other make or nature, in whole

1108 or part payment for Edison Phonographs, Records or Blanks, is contrary to the conditions hereof. This does not prohibit the acceptance of a talking machine at full list price, if good as new (or less cost of necessary repairs to make good as new) in exchange for an Edison Phonograph sold at full retail list price; or the acceptance of records at not to exceed the list price rough of blanks in exchange for Edison Records sold at full retail list price; the exchange of Edison Phonographs or Edison Records being subject to conditions stated in Paragraph No. 6.

1109 No. 6. The selling or offering for sale, of Edison Phonographs, Records or Blanks, that have become shop-worn, or have been taken in exchange, as second-hand machines, records or blanks at reduced prices, will be considered a cutting of prices and will not be allowed. This does not prohibit the shaving of old records and selling them as, and at the price of shaved Blanks.

1110 No. 7. Exchange between dealers. Authorized dealers will in case of emergency or necessity, be allowed to borrow from any other authorized dealer, provided the goods so borrowed are actually replaced with goods of the same style and make. In case a sale takes place between two dealers, it must be at full list prices.

No. 8. All Edison Phonographs, Records and Blanks are covered by United States patents and are sold under the condition that the license to use and vend them implied from such sale is dependent on the observance by the vendee of all the foregoing conditions; upon the breach of any of said conditions, the license to use or vend said phonographs, records and blanks immediately ceases and any vender or user thereafter becomes an infringer

of said patents and may be proceeded against by 1111
suit for injunction or damages, or both.

Conditional Credit Memorandum. On or about
the 15th of each month, a memorandum will be
sent each Dealer showing the total number of
Phonographs, Records and Blanks purchased by
you during the previous month. If this memoran-
dum is returned at the time indicated thereon,
properly signed and verified to the satisfaction of
this Company, a credit of 10 per cent. from list
price on such Phonographs, Records and Blanks
will be allowed the dealer so returning same.

[Note: This paragraph is cancelled by lines 1112
drawn through in the original exhibit.]

The discounts first mentioned represent the full
Retail Dealers' discounts, but an extra credit as
above stated is offered as a special consideration for
advantages accruing to us through having our spe-
cialties sold at a price that affords the dealer a
profit large enough to warrant his energetically
and exclusively pushing their sale, and complying
with the other conditions of sale, herein mentioned.
This credit will not, under any circumstances, be
allowed where the terms and conditions of sale are
not strictly complied with.

[Note: This paragraph is cancelled by lines 1113
drawn through in the original exhibit.]

National Phonograph Company,
Orange, New Jersey,

New York Office, 135 Fifth Avenue.

Chicago Office, 144 Wabash Avenue.

Foreign Department, 15 Cedar St., New York.

Corrected to January 2, 1902.

These exhibits are the printed booklets of National Phonograph Co.

In Chancery of New Jersey.

On Bill &c.,
Release of Na-
tional Phonograph
Company to Re-
ceive.

Raymond R. Wile
Research Library

Phonograph Company and allowed by said receiver, 1117
the claims so assigned being as follows:

Charles B. Carman,	\$ 15,727.50
Walter Cutting, Ex'r.,	14,678.93
Dyer & Seeley,	2,481.78
Marion E. Edison,	5,242.43
Edison Phonograph Works,	37,115.92
Estate of Thomas Butler,	676.85
James Gaunt,	20,969.93
Michael W. Nolan,	26,212.57
Thomas A. Edison,	273,768.27

\$396,874.18

said assignments having been filed with the said 1118
receiver.

And whereas final decree of distribution was made in the above entitled cause on the second day of August, eighteen hundred and ninety-eight, directing the said receiver to distribute to the general creditors of said corporation *pro rata* to the several claims, the balance remaining in his hands, as shown by his final account filed and allowed in said cause:

And whereas the said National Phonograph Company, as one of said general creditors, is under such distribution entitled to a dividend of .179 on its said claim of Three hundred and ninety-six thousand eight hundred and seventy-four dollars and eighteen cents: 1119

And whereas satisfaction of said dividend has been made by said receiver, pursuant to the directions of said final decree, by the receipt of the said receiver to the said National Phonograph Company, for the sum of Forty-two thousand five hundred dollars, representing the balance of the purchase price of the assets of the North American Phonograph Company, purchased at the receiver's sale thereof, on the eighth day of February, eighteen

1120 hundred and ninety-six, such balance having remained unpaid to the present time, pursuant to the terms of said sale; by the receipt of the said receiver to the said National Phonograph Company, for the sum of Six thousand four hundred and thirty-one dollars and sixty-six cents, representing interest on said unpaid balance of Forty-two thousand five hundred dollars, from the date of said sale, February eighth, eighteen hundred and ninety-six, to the sixteenth day of August, eighteen hundred and ninety-eight, at six per cent., such interest being chargeable pursuant to the terms of said sale; by the payment to Michael W. Nolan, of the sum of

1121 Nine thousand two hundred and thirteen dollars and thirty-three cents, pursuant to the directions of an order given by the said National Phonograph Company to the said receiver, bearing date the day of June, eighteen hundred and ninety-six, and filed with the said receiver, about the first of July, in the same year, said order having been payable out of the monies in the hands of said receiver, belonging to said National Phonograph Company, and by the payment this day, by said receiver to the said National Phonograph Company, of the sum of Twelve thousand nine hundred and eleven dollars and sixty-one cents:

1122 Now know all men by these presents, that the said National Phonograph Company, for and in consideration of the sum of seventy-one thousand and fifty-six dollars and sixty cents, lawful money of the United States, to it in hand paid by John R. Hardin, receiver of the North American Phonograph Company, has remised, released and forever discharged, and by these presents does for itself, its successors and assigns, release and forever discharge the said John R. Hardin, receiver as aforesaid, his heirs, executors and administrators, of and from all manner of actions, suits, accounts, v

claims, debts, dues and demands whatsoever, which 1123
it ever had, now has, or which it, or its successors
or assigns, at any time hereafter, can or may have,
claim or demand, against the said John R. Hardin,
as receiver of the said North American Phonograph
Company, or individually, for touching or concern-
ing the management or disposition of the property
and assets of the said North American Phonograph
Company, or of the receivership thereof, or for or
by reason of any money or other property by him
received as such receiver, or out of said estate, or
by reason of any matter, cause or thing whatsoever
from the beginning of the world to the day of the
date hereof: Provided always, that nothing herein
shall release or discharge the said John R. Hardin, 1124
receiver as aforesaid, from any liability to the said
National Phonograph Company, by reason of any
assets of said estate of the North American Phono-
graph Company which may hereafter come to his
hands as such receiver. And the said National
Phonograph Company, does for itself, its success-
ors and assigns, covenant and agree to and with the
said John R. Hardin, receiver as aforesaid, as a
part of this release, that it, the said National Phono-
graph Company, is the true, right and lawful own-
er of the several claims in the recital of this release
mentioned, and that it alone is entitled to receive
the dividend on said claims out of the estate of the 1125
said North American Phonograph Company: And
the said National Phonograph Company hereby
covenants and agrees to and with the said John R.
Hardin, to indemnify and save him harmless
against any claim that hereafter may be made or
established by any of said original claimants, or
assignees thereof, against the said receiver, by rea-
son of said claims against the North American
Phonograph Company.

In witness whereof, the said National Phono-

- 1126 graph Company has caused these presents to be signed by its President, and its corporate seal to be hereto affixed, attested by its Secretary, this nineteenth day of August, eighteen hundred and ninety-eight.

W. S. Mallory,
President.

[SEAL.]

Attest
J. F. Randolph,
Secretary.

State of New Jersey, }
County of Essex, } ss.:

- 1127 Be it remembered, that on this twentieth day of August, in the year one thousand eight hundred and ninety-eight, before me, the subscriber, a Master of the Court of Chancery of New Jersey, personally appears John F. Randolph, who being by me duly sworn doth depose and make proof to my satisfaction, that he well knows the corporate seal of the National Phonograph Company, the releasor named in the foregoing release; that the seal there-to affixed is the proper corporate seal of the said National Phonograph Company; that the same was so affixed thereto, and the said release signed and delivered by Walter S. Mallory who was at the date and execution thereof the President of said company, in the presence of deponent, as the voluntary act and deed of said company, and that deponent thereupon signed the same as subscribing witness.

1128

J. F. Randolph.

Sworn and subscribed before me
this twentieth day of August,
A. D. 1898, at Newark.

Howard W. Hayes,
Master in Chancery
of New Jersey.

**Complainant's Exhibit 102 June 10th, 1129
1903, J. A. S. Ex'r.**

Agreement. Jesse H. Lippincott with the North American Phonograph Company. July 17, 1888.

Memorandum, made the 17th day of July, 1888, between Jesse H. Lippincott of New York City, and the North American Phonograph Company, hereinafter described as the "Company."

Witnesseth:

1. That said Lippincott owns or controls or has the right to use Letters Patent of the U. S., granted to T. A. Edison, numbered 200,521; 201,760; 213,554; 227,679; 382,414; 382,416; 382,417; 382,418; 382,419; 382,462; 386,974, and inventions covered thereby and also owns or controls or has the right to use in the U. S. and Canada other inventions of said Edison relating to Phonographs. Also that said Lippincott as sole licensee of the American Graphophone Company has the exclusive right to use, or let or sell to others to use in the U. S., the inventions covered by Letters Patent of the U. S., granted to A. G. Bell, C. A. Bell and Tainter, numbered 341,212, and 341,213, and to C. A. Bell and Tainter, 341,214, and to Tainter, 341,287; 341,288; 374,133; 375,579 and 380,535, and owns or has right to use or may hereafter own or have right to use inventions which are or may be embodied in the Graphophone (hereafter to be designated "Phonograph-Graphophone").

2. That said company has been organized under the laws of the State of New Jersey for the purpose of exploiting and introducing said instruments, both Phonographs and Phonograph-Graphophones, and desires to obtain from said Lippincott the

1132 rights, privileges and license necessary for such business.

3. That in consideration of the sum of \$6,560,000 paid by said company to said Lippincott, not in cash, by the the issuing to him of \$6,560,000 full paid capital stock of said company, receipt of which is hereby acknowledged, and payments hereinafter provided for in cash, said Lippincott has sold and hereby sells and transfers and confers to and upon the said company all the rights which he has or may hereafter have to use the patents and inventions of said Edison relating to Phonographs, as aforesaid, and all rights and interests which he now has or may hereafter have in the patents of said Edison, and any reissue or extension thereof, and all the rights which he acquired and all the rights which were agreed to be conferred upon said company by a certain agreement between said Edison and said Lippincott, dated June 28, 1888, copy hereto annexed, and all the stock of the Edison Phonograph Company, referred to in said agreement which said Lippincott may acquire or be entitled to receive and immediately upon receipt of the stock, said Lippincott will transfer the same to the company. And also all the rights which he, said Lippincott, now has or may hereafter have under or by virtue of a certain agreement between himself and the American Graphophone Company, dated March 26, 1888, copy hereto annexed, said company assuming and agreeing to make all payments for instruments, &c., and to carry out the agreements made by said Lippincott in respect to said instruments, supplies, &c., and the purchase thereof and the conduct of the business therein provided to be done in respect to the exploiting and introduction of the Graphophone.

4. The said Lippincott agrees to procure for said

company from the proper parties all such authority as may be required to permit the handling or exploiting of the Phonograph and Graphophone together. 1135

5. The said Lippincott agrees to procure for said company any authority required from the Edison Speaking Phonograph Company or to protect the company from interference from said Edison Speaking Phonograph Company, but at the expense of the company if license fee or royalty is to be paid, but nothing herein contained shall be considered as an agreement on the part of Lippincott to sell or transfer to said company any stock of said Edison Speaking Phonograph Company which he has acquired or may acquire by purchase or otherwise. 1136

6. Nothing herein contained shall be construed as an agreement on the part of said Lippincott to sell or transfer to said company, any stock of the American Graphophone Company or the Volta Company, or the Volta Laboratory Company or Association which he has acquired or may acquire by purchase or otherwise.

7. From the first moneys that the company shall receive from its business operations, it shall pay to said Lippincott the sum of two hundred thousand dollars. 1137

8. The said Lippincott agrees to procure and cause to be executed by the Edison Phonograph Works (a corporation organized or to be organized), a contract for the manufacture of Phonographs, &c., substantially on the terms of the draft contract hereto annexed.

9. The said Lippincott will procure and cause to be executed by said Edison, a contract as to the marketing of the Phonographs, patents, future in-

1138 ventions, experiments, &c., extras, &c., substantially on the terms set forth in the draft contract hereto annexed.

10. It is agreed that a further agreement shall be entered into between the American Graphophone Company and said Lippincott, substantially on the terms set forth in a memorandum hereto annexed, modifying, &c., the agreement heretofore made between said Lippincott and said American Graphophone Company.

1139 11. The said Lippincott will at any and all times hereafter make, execute, sign, seal and deliver any and all contracts, agreements, assignments and other papers which may be necessary to carry out the spirit and intent of this memorandum, and to fully vest in the company the rights, property, privileges and license intended to be acquired by said company.

1140 12. It is understood that this memorandum is to be supplemented by a more formal agreement or agreements, and with certain assignments and license, all of which are to be proposed by J. Adriance Bush, the counsel for the company, and the said company, said Lippincott and the said company agree to execute all papers that said Bush shall determine are necessary to carry out the intent, terms, &c., of this memorandum.

Jesse H. Lippincott. (L. S.)

In presence of
J. Adriance Bush.

**Complainant's Exhibit 103, June 10
1903, J. A. S., Ex'r.**

This exhibit is the "agreement made this first day of August, 1888, by and between Thomas A. Edison, of Llewellyn Park...., North American

Phonograph Company, a corporation, ... and 1141
Jesse H. Lippincott" set forth in complainant's exhibit 46, March 18, 1903, J. A. S., Ex'r.

**Complainant's Exhibit 104, June 10,
1903, J. A. S., Ex'r.**

This exhibit is the "agreement made this first day of August, 1888, by and between The North American Phonograph Co., a corporation..... and Jesse H. Lippincott..... and the Edison Phonograph Works, a corporation" set forth in Complainant's Exhibit 46, March 18, 1903, J. A. S., Ex'r.

1142

**Complainant's Exhibits 105-106, June
10, 1903, J. A. S., Ex'r.**

These exhibits are set forth in the record at Q75 and Q79, testimony of Lombard.

**Complainant's Exhibit 107, June 10,
1903, J. A. S., Ex'r.**

Circular Letter, #19.

Office of

The North American Phonograph Co.,
and Jesse H. Lippincott, Sole Licensee of the
American Graphophone Co.,
160, 162 & 164 Broadway,

1143

Telephone Call,
"961 John."

P. O. Box 2592.

New York, February 3rd, 1890.

To the Phonograph Companies,

Gentlemen:

The New Jersey Phonograph Company inform us that one Lewis Rinkel leased from them one type "M" Phonograph #6955 and they have reason

1144 to believe he has left their territory taking the machine with him.

Will you kindly request your inspectors and agents to be on the lookout for this machine and report the same to us as soon as found?

Yours very truly,

The North American Phonograph Co.,

Thomas R. Lombard,

V. P.

**Complainant's Exhibit 108, June 10,
1903, J. A. S., Ex'r.**

1145

No. 49.

Circular Letter.

Office of

The North American Phonograph Co.,

and Jesse H. Lippincott, Sole Licensee of the

American Graphophone Co.,

160, 162 & 164 Broadway,

P. O. Box 2592.

New York, Dec. 4th, 1890.

1146

Note.—Our circular letters are sent to each company for the purpose of giving information on points of general interest to the enterprise. Points that arise in the experience of any one company—that may be of benefit to other companies—will, if sent to us, be communicated to them by means of these circular letters.

We desire to call your special attention to the importance of immediately acknowledging receipt of these letters and of keeping them on file for ready reference.

To the Phonograph Companies,

Gentlemen:

At the meeting of the Executive Committee held at the office of the company, December 3rd, 1890, the following resolution was unanimously adopted:

"Resolved, That the results of exclusively leasing Phonographs and Phonograph-Graphophones have proved unsatisfactory to this company and that therefore in pursuance of the rights reserved by this company in its agreements with its sub-companies and licensees it is further

1147

Resolved, That each and every one of the sub-companies or licensees, acting under agreements with this company, be directed and required on and after December 15th, 1890, to give the public the option of either leasing Phonographs and Phonograph-Graphophones at rentals heretofore fixed, or of purchasing said Phonographs and Phonograph-Graphophones at prices which for the present are hereby fixed by The North American Phonograph Company as follows:

1148

For all machines with Water Power Attachment, Treadle Power Attachment or Motor to be run by Battery Power Attachment, as now constructed, \$150 per machine f. o. b., and for the machine with attachment adapted to be used with electric light current (up to 120 volts) \$165 f. o. b. And

Resolved, That the Vice-President of this company be and he is hereby directed to send to each and every of the sub-companies and licensees of this company such notices and to take such other action as may be necessary to carry these resolutions into effect."

1149

Your attention is respectfully called to this, and further information will be given you in a few days.

Yours very truly,

The North American Phonograph Co.,

By Thos. R. Lombard,

V. P.

1058

1160

1161

1162

Office of
 THE NORTH AMERICAN PHONOGRAPH CO., and JESSE H. LIPPINCOTT,
 Sole Licensee of THE AMERICAN GRAPHOPHONE CO.,
 160 Broadway, New York, Dec. 15th, 1890.

Article.	Manufactured by	at	Quantity.	Price to Phono. Co.'s F. O. B. at place of Mfg.	Price to Public. Trans. to be added.
Phonograph Class "M," "W," or "T".....	E. P. Wks.	Orange, N. J.	Each.	\$107.50	\$150.00
Division as per contract.					
Price to public				\$150.00	
Cost to this Co.....				65.00	
$\frac{1}{2}$ the difference of.....				\$85.00 =	\$42.50
To which add cost as above.....				65.00	
Equals our proportion				\$107.50	
Phonograph Class "E"	do	do	do	\$120.00	\$165.00
(With resistance box complete.)					
Division as per contract.					
Price to public				\$165.00	
Cost to this Co.....				75.00	
$\frac{1}{2}$ the difference of				\$90.00 =	\$45.00
To which add cost as above.....				75.00	
Equals our proportion				\$120.00	

The above prices taking effect upon the date hereof.

The North American Phonograph Co.
 Thos. R. Lombard, V. P.

384

Office of
THE NORTH AMERICAN PHONOGRAPH CO., and JESSE H. LIPPINCOTT,
Sole Licensee of THE AMERICAN GRAPHOPHONE CO.,

Quotation Circular No. 38.

160 Broadway, New York, Dec. 15th, 1890.

Article.	Manufac- tured by	at	Quantity.	Price to Phone Co.'s F. O. B.	Price to Public. Trans. to be added.
Phonograph-Graphophone Type "C" (Hand pattern at same price.)	Am. G. Co.	Bridgeport.	Each.	\$82.50	\$125.00
Division as per contract.					
Price to public				\$125.00	
Cost to this Co.				50.00	
$\frac{1}{2}$ the difference of.....				\$75.00=	\$37.50
Plus cost as above.....				50.00	
Equals our proportion				\$87.50	
Less concession as per circular letter No. 50.....				5.00	
Price to Phono. Cos.....				\$82.50	

The above prices taking effect upon the date hereof.

The North American Phonograph Co.
Thos. R. Lombard, V. P.

1165

1164

1163

1059

1156 **Complainant's Exhibit 109, June 10,
1903, J. A. S., Ex'r.**

Circular Letter.

No. 51.

Office of

The North American Phonograph Co.,
and Jesse H. Lippincott, Sole Licensee of the
American Graphophone Co.,
160, 162 & 164 Broadway,
P. O. Box 2592.

New York, Dec. 16th, 1890.

Note.—Our circular letters are sent to each company for the purpose of giving information on points of general interest to the enterprise. Points

1157 that arise in the experience of any one company—that may be of benefit to other companies—will, if sent to us, be communicated to them by means of these circular letters.

We desire to call your special attention to the importance of immediately acknowledging receipt of these letters and of keeping them on file for ready reference.

1158

387.

(Dictated to and transcribed from the Phonograph.) 1159

To the Phonograph Companies,

Gentlemen:

We have this day forwarded to you telegram as follows:

"Owing to litigation instituted by Automatic Phonograph Company and injunction served upon us, we request you to refrain from any action under our Circular #49 relating to sale of machines until further advised by us."

We hereby beg to confirm said telegram.

Yours very truly,

The North American Phonograph Co., 1160

Thos. R. Lombard.

**Complainant's Exhibit 110, June 12,
1903, J. A. S., Ex'r.**

This agreement, made this day of
18 , between The Phono-
graph Company, a corporation duly organized un-
der the laws of the State of and act-
ing under authority of The North American Phono-
graph Company and Jesse H. Lippincott, Sole Li-
censee of the American Graphophone Company,
party of the first part, and hereinafter called the
Lessor, and 1161

of

party of the second part, hereinafter called the
Lessee,

Witnesseth:

That the Lessor has let and hired for use, within
the following described territory,

and by these presents doth let and hire for use
within said territory unto the said Lessee the fol-
lowing described machine and personal property:

1162 for the term of from the date
hereof, at the rent or hire of Forty dollars per year,
payable from and after the date of delivery to the
Lessee of above-described personal property as fol-
lows:

1163 And it is further agreed by and between the
parties to these presents, that if default shall be
made in the payment of the rent hereinbefore pro-
vided for, or of any of the installments thereof,
then it shall be lawful for the Lessor to re-enter,
and said Lessor may re-enter into the possession of
the personal property above described, and may
enter upon the premises of the Lessee and upon any
other premises where the same may be found and
take away, repossess and enjoy the said personal
property as though these presents had never been
made, without any liability, accountability or re-
sponsibility of the Lessor to the Lessee, or any
other person or persons for so doing, and it is agreed
that such re-entry or notice of such re-entry or any
notice of cancellation and annulment hereof, sub-
sequent to such default, shall operate as a full and
complete cancellation and annulment of this agree-
ment and license, and the Lessee hereby agrees not
thereafter to plead this license in answer to a charge
of infringement and not, at any time hereafter, to
contest or assail or to aid or encourage others to
contest or assail, the validity of any patents relat-
ing to Phonographs or Phonograph-Graphophones
or appliances therefor now held or enjoyed, or
which may hereafter be held or enjoyed, by The
North American Phonograph Company and under
which the Lessor herein may hold licenses, or of
any reissues or extensions thereof.

1164 And the lessee does covenant and agree that the
said personal property shall be taken to and
there held and kept, and not removed therefrom

without the written consent of the lessor first had and obtained, and at the expiration or sooner determining of the said term that he will quit and surrender and deliver possession of the said personal property to the lessor in like good order and condition, reasonable use and wear thereof excepted. 1165

And the lessor does covenant that the lessee, upon paying the above specified rental and upon performing the covenants herein contained on his part, shall and may peaceably and quietly have, hold, use and enjoy said personal property within the territory aforesaid for the said term. The said lessee shall not assign this lease, nor sub-let, nor under-let, nor sub-hire the said personal property without the written consent of the lessor endorsed hereon, under penalty of forfeiture and damages, and in case of such assignment or sub-letting or under-letting or sub-hiring without such written consent, the lessor shall have the right to take immediate possession of said personal property. 1166

It is understood by the said lessee, and hereby agreed, that the personal property hereby leased is and shall at all times be and remain the property of The North American Phonograph Company, and that the same is leased and licensed to the lessee herein, under and subject to the restrictions and provisions of a certain agreement made between said The North American Phonograph Company and the lessor herein, dated , 18 , and not otherwise; and nothing in this agreement contained shall be construed as or have the effect of vesting in the lessee any right, title or interest in or to the same, except the right to use the same during the term of this agreement, within the territory aforesaid, upon making each and every payment for the use thereof, as herein provided. 1167

It is understood that this agreement of license

1168 is entered into by the lessor in part consideration of the recognition by the lessee of the validity of, and the lessee does hereby admit, the validity of all patents relating to Phonographs and Phonograph-Graphophones and appliances therefor, now held or enjoyed or which may hereafter be held or enjoyed by The North American Phonograph Company and under which the lessor herein may hold licenses.

In further consideration of this agreement of license the lessee hereby agrees not at any time or in any place to make, use or sell Phonographs or Phonograph-Graphophones or appliances therefor in infringement of any patents relating to Phonographs or Phonograph-Graphophones or appliances therefor now held or enjoyed, or which may hereafter be held or enjoyed, by The North American Phonograph Company, or under which the lessor herein may hold licenses, and not at any time, or in any place, to use the same except under and by the license and authority of said The North American Phonograph Company and of the lessor so long as any of said patents remain in force, and agrees not to make or purchase or sell or use, at any time, extra cylinders, special extras, parts of or appliances for Phonographs or Phonograph-Graphophones except such as are made by or under the license or authority of said The North American Phonograph Company.

1170 It is hereby further expressly understood and agreed that the rights and liabilities herein given to or imposed upon *either of the parties hereto shall extend to the successors, executors, administrators and assigns of such party*, except as herein provided, as though they were in each case named.

In witness whereof,

Note: It is agreed that the whole agreement be-

tween the parties is contained in this lease, and 1171
that all representations and all warranties unless
reduced to writing and inserted herein are void.

Endorsed: The Phonograph Company
to LEASE of Phonograph No. Phon-
ograph-Graphophone No. Term Dated
..... 18 .

**Complainant's Exhibit 111 of June
12, 1903, J. A. S., Ex'r.**

Number 153. 10 shares.

Incorporated under the Laws of the State of
New Jersey. The North American Phonograph 1172
Company. Issued for property purchased.

This certifies, that Jesse H Lippincott, is entitled
to Ten shares in the Capital Stock of The North
American Phonograph Company, transferable only
on the books of said company in person or by at-
torney on the surrender of this certificate

In Witness Whereof, the said company has
caused this certificate to be signed by
its president and treasurer.

[SEAL The North American
Phonograph Co. Incorporated under
the laws of New Jersey. 1888.]

Jersey City, N. J., May 18, 1889.

1173

Jesse H. Lippincott,
President.
John Robinson,
Treasurer.

66,000 shares par value \$100 each. Full paid and
Unassessable. Capital stock \$6,600,000.

Countersigned and registered, The Mercantile
Trust Company. C. Hunter, Secretary.

Endorsed: For value received I have bargained,
sold, assigned and transferred and by these

1174 presents do bargain, sell, assign and transfer unto James L. Andem, Cincinnati, Ohio, the Capital Stock named in the within certificate, and do hereby constitute and appoint true and lawful attorney, irrevocable, for and in name and stead, but to use, to sell, assign, transfer and set over, all or any part of the said stock, and for that purpose to make and execute all necessary acts of assignment and transfer, and one or more persons to substitute with like full power.

Dated May 18, 1889.

Jesse H. Lippincott.

1175 Signed and acknowledged }
in presence of }
C. Walcutt.

**Complainant's Exhibit 112, October
21, 1903, J. A. S., Ex'r.**

CIRCUIT COURT OF THE UNITED STATES,
SOUTHERN DISTRICT OF NEW YORK.

1176

NEW YORK PHONOGRAPH COM-
PANY,
Complainant,

vs.

NATIONAL PHONOGRAPH COM-
PANY *et al.*,
Defendants.

In Equity.

Please take notice that we shall proceed to take proofs for final hearing on the part of the complainant herein under the 67th rule of the rules of practice in equity prescribed by the Supreme

Court and in accordance with the statutes in such case made and provided and in pursuance of the rules and practice of this Court before John A. Shields, Esq., a standing examiner of this Court, or other proper officer, at his office in the Post-Office Building, in the City and Southern District of New York, on the 21st day of October, 1903, at eleven (11) o'clock in the forenoon. You are invited to attend and cross-examine the witnesses produced. The examination will be adjourned from day to day and to such time and place as may be required without further notice. 1177

You will also please take notice that the testimony to be taken on the part of the complainant will be adduced orally and taken stenographically pursuant to said 67th rule. 1178

Dated New York, October 15, 1903.

Yours, &c.,

Elisha K. Camp,

Solicitor for Complainant.

Louis Hicks,

Of Counsel for Complainant.

To

Messrs. Robinson, Biddle & Ward,

Solicitors for Defendants.

Howard W. Hayes,

Of Counsel for Defendants.

Ordered accordingly. 1179

John A. Shields,

Examr.

Endorsed: A copy received Oct. 15, 1903. Robinson, Biddle & Ward.

1180 Complainant's Exhibit 113, Oct. 21,
1903, J. A. S., Ex'r.

CIRCUIT COURT OF UNITED STATES.

SOUTHERN DISTRICT OF NEW YORK.

NEW YORK PHONOGRAPH COM-
PANY,
Complainant,

against

1181 NATIONAL PHONOGRAPH COM-
PANY *et al.*,
Defendants.

UNITED STATES *ex rel.* NEW YORK
PHONOGRAPH COMPANY,

against

WILLIAM E. GILMORE.

1182 An order having been made and entered June 16, 1903, by the Circuit Court of the United States for the Southern District of New York, directing William E. Gilmore to be and appear as a witness to testify in the suit of New York Phonograph Company against National Phonograph Company before me, the undersigned, as examiner, at my office in the Post-Office Building, in the City and Southern District of New York, on June 19, 1903, and at such further time or times, as I, the said examiner, shall direct, and that he bring with him and produce before me, the said examiner, at the said times all the books and papers enumerated in the subpoena dated May 8, 1903, in his custody

or control individually or as President of National Phonograph Company; 1183

And an appeal having been taken by said William E. Gilmore from said order of June 16, 1903, and an order having been made and entered staying said order of June 16, 1903, until the hearing and determination of said appeal, and it appearing from the mandate of the Circuit Court of Appeals for the Second Circuit, and from the order of said Circuit Court entered thereon July 30, 1903, that said appeal has been heard and determined and dismissed; now, pursuant to said order of June 16, 1903, and on motion of Louis Hicks, of counsel for New York Phonograph Company, I, John A. Shields, the examiner mentioned in said order 1184

Hereby designate, direct and appoint the 21st day of October, 1903, at 11 o'clock in the forenoon, as the time at which said William E. Gilmore shall be and appear before me at my office in the Post Office Building, in the City and Southern District of New York, to comply with the provisions and direction of said order of June 16, 1903.

Dated New York, October 15, 1903.

John A. Shields,
Examiner.

To

William E. Gilmore, Esq.,
John W. Griggs, Esq.,
Counsel for William E. Gilmore. 1185
Howard W. Hayes, Esq.,
Solr. for William E. Gilmore and
Counsel for National Phonograph Company.
Messrs. Robinson, Biddle & Ward,
Solicitors for National Phonograph Company.

Endorsed: A copy received. Oct. 15, 1903.
Robinson, Biddle & Ward.

1070

396

1186 **Complainant's Exhibit 114, Oct. 21,
1903, J. A. S., Ex'r.**

DEPARTMENT OF THE INTERIOR,
(Cut.)

United States Patent Office.

To all persons to whom these presents shall come,
,Greeting:

This is to certify, That the annexed is a true
copy from the records of this office of an instrument
of writing executed by Edison Phonograph Com-
pany, and Recorded, October 7, 1896, in Liber W
53, page 375. Said record has been carefully com-
pared with the original and is a correct transcript
of the whole thereof.

1187

In testimony whereof, I have hereunto set my
hand and caused the seal of the Patent
Office to be affixed at the City of Wash-
ington this 30th day of July, in the year
of our Lord one thousand nine hundred
and three and of the Independence of
the United States of America the one
hundred and twenty-eighth.

[SEAL.]

E. B. Moore,

Acting Commissioner of Patents.

Liber W 53.

Page 375.

1188

Whereas, the undersigned, Edison Phonograph
Company, is the owner by assignment of certain
Letters Patent of the United States, granted upon
inventions of Thomas A. Edison, for improvements
in Phonographs and related subjects, which Let-
ters Patent are numbered and dated as follows:

430276, dated June 17, 1890. 430278, dated June
17, 1890; 484583, dated October 18, 1892;

And whereas, by virtue of an agreement of com-
promise with John R. Hardin, receiver of the North
American Phonograph Company, said Hardin, as

receiver, is entitled to an assignment of said Letters Patent; 1189

Now, therefore, to whom it may concern be it known that for and in consideration of the premises and the sum of One dollar paid to the said Edison Phonograph Company, the said Edison Phonograph Company has sold, assigned and transferred, and by these presents does sell, assign and transfer unto the said John R. Hardin, receiver, and his assigns and successors in office, the whole right, title and interest in and to each of said Letters Patent, the same to be held and enjoyed by the said John R. Hardin, receiver, and his assigns and successors in office to the full end of the term for which said Letters Patent are or may be granted, as fully and entirely as the same would have been held and enjoyed by the said Edison Phonograph Company had this assignment and sale not been made. 1190

In testimony whereof, the said Edison Phonograph Company, by its president, has executed the presents this 16th day of January, A. D., 1896.

Edison Phonograph Company,
By Thomas A. Edison,
President.

Attest:

Edison Phonograph Company.

1191

[SEAL.] Organized, 1887.

Laws of New Jersey.

J. F. Randolph, Secretary.

State of New Jersey, }
County of Essex, } ss.:

On this 17th day of January A. D., 1896, before me Commissioner of Deeds and Notary Public in and for the State of New Jersey personally appeared Thomas A. Edison, to me known, and acknowledged to me that he is the president of the Edison Phonograph Company whose name is

- 1192 signed to the foregoing assignment; that the seal affixed to said assignment is the seal of said company, and that he signed his name as president of said company as the free act and deed of said company, for the uses and purposes therein set forth.

John F. Randolph,

Commissioner of Deeds & Notary Public,

State of New Jersey.

John F. Randolph,

[SEAL.] Notary Public,

New Jersey.

Recorded: Oct, 7, 1896.

1193 **Complainant's Exhibits 115-124, October 21, 1903, J. A. S., Ex'r.**

To each of these ten exhibits a certificate is prefixed identical with the certificate prefixed to complainant's exhibit 114, October 21, 1903, J. A. S., Ex'r., except that after the words "executed by" and instead of "Edison Phonograph Company and recorded October 7, 1896, in Liber W., 53, page 375," there should be in exh. 115 "Thomas A. Edison, and recorded October 7, 1896, in Liber W 53, page 369"; in Exh. 116, "Thomas A. Edison, May 8, 1900, and recorded May 22, 1900, in Liber G, 61, page 351"; and in Exh. 117, "Thomas A. Edison, recorded February 27, 1903, in Liber P, 66, page 479"; and in Exh. 118, "Thomas A. Edison, July 27, 1888, and recorded November 5, 1888, in Liber K, 39, page 142"; and in Exh. 119, "Thomas A. Edison, December 16, 1902, recorded in Liber D 66, page 473"; and in Exh. 120, "Thomas A. Edison, April 26, 1901, recorded in Liber Z, 62, page 373"; and in Exh. 121, "Thomas A. Edison, December 24, 1901, and Recorded in Liber U, 63, page 465"; and in Exh. 122, "Thomas A. Edison, October 2, 1901, and recorded October 4, 1901, in Liber

1194

H, 64, page 66"; and in Exh. 123, "Thomas A. Edison and The North American Phonograph Company, May 22, 1893, and recorded in Liber P, 48, page 146"; and in Exh. 124, Thomas A. Edison and The North American Phonograph Company, May 23, 1893, and recorded in Liber P, 48, page 148"; and in exhibits 117-124 inclusive the date of the eight certificates is August 25, 1903, instead of July 30, 1903.

1195

"Complainant's Exhibit 115, 1903. J. A. S., Ex'r."

Liber W 53, page 369.

1196

Whereas I, Thomas A. Edison of Llewellyn Park, County of Essex and State of New Jersey, did obtain certain letters patent of the United States for improvements in Phonographs and related subjects, such letters patent being numbered and dated as follows:

397,280,	dated	February	5, 1889;
400,649,	dated	April	2, 1889;
397,706,	dated	February	12, 1889;
400,650,	dated	April	2, 1889;
437,424,	dated	September	30, 1890;
406,568,	dated	July	9, 1889;
488,191,	dated	December	20, 1892;
406,569,	dated	July	9, 1889;
406,570,	dated	July	9, 1889;
406,571,	dated	July	9, 1889;
437,425,	dated	September	30, 1890;
406,572,	dated	July	9, 1889;
430,277,	dated	June	17, 1890;
406,573,	dated	July	9, 1889;
406,574,	dated	July	9, 1889;
406,575,	dated	July	9, 1889;
406,576,	dated	July	9, 1889;

1197

1198	414,759,	dated	November	12, 1889;
	414,760,	dated	November	12, 1889;
	426,527,	dated	April	29, 1890;
	423,039,	dated	March	11, 1890;
	414,761,	dated	November	12, 1889;
	437,426,	dated	September	30, 1890;
	465,972,	dated	December	29, 1891;
	443,507,	dated	December	30, 1890;
	513,095,	dated	January	23, 1894;
	437,427,	dated	September	30, 1890;
	437,429,	dated	September	30, 1890;
	454,941,	dated	June	30, 1891;
	484,584,	dated	October	18, 1892;
1199	484,585,	dated	October	18, 1892;
	454,942,	dated	June	30, 1891;
	456,301,	dated	July	21, 1891;
	453,741,	dated	June	9, 1891;
	456,302,	dated	July	21, 1891;
	541,923,	dated	July	2, 1895;
	500,280,	dated	June	27, 1893;
	500,281,	dated	June	27, 1893;
	457,344,	dated	August	11, 1891;
	541,924,	dated	July	2, 1895;
1200	500,282,	dated	June	27, 1893;
	460,123,	dated	September	29, 1891;
	496,191,	dated	April	25, 1893;
	513,097,	dated	January	23, 1894;

And whereas by virtue of agreement of compromise between myself and John R. Hardin, receiver of the North American Phonograph Company, said Hardin is entitled, as receiver, to an assignment of the said letters patent.

Now, therefore, to whom it may concern, be it known that for and in consideration of the premises and the sum of One dollar in hand paid, I, the said Thomas A. Edison, have sold, assigned and transferred, and by these presents do sell, assign and transfer into the said John R. Hardin, receiver

of the North American Phonograph Company and 1201
 his assigns and successors in office, the whole right,
 title and interest in and to each of the aforesaid
 Letters Patent the same to be held and enjoyed by
 the said John R. Hardin, receiver, and by his as-
 signs and successors in office, to the full end of the
 term for which said Letters Patent are or may be
 granted, as fully and entirely as the same would
 have been enjoyed and held by me had this assign-
 ment and sale not been made.

In testimony whereof, I have hereunto set my
 hand and affixed my seal this 16th day of January,
 A. D., 1896.

Thomas A. Edison. 1202

In the presence of
 Rich. N. Dyer.

State of New Jersey, }
 County of Essex, } ss.:

On this 17th day of January, 1896, before me
 Commissioner of Deeds and Notary Public in and
 for the State of New Jersey personally came
 Thomas A. Edison, to me known, and known to me
 to be the individual described in and who executed
 the foregoing assignment and acknowledged to me
 that he signed, sealed and delivered the same as
 his free act and deed for the uses and purposes
 therein set forth.

1203

John F. Randolph,
 Commissioner of Deeds & Notary Public,
 State of New Jersey.

John F. Randolph,
 Notary Public,
 New Jersey.

[SEAL.]

Recorded, Oct. 7, 1896.

**1204 Complainant's Exhibit 113, Oct. 21,
1903, J. A. S., Ex'r.**

Liber G, 61. P. 351.

Whereas I, Thomas A. Edison, of West Orange, County of Essex, State of New Jersey, did obtain letters patents of the United States of America, for the following inventions entitled, numbered and bearing date as follows:

393,466, November 27, 1888, Phonograph Recorder.

400,648 April 2, 1889, Phonogram Blank.

430,274, June 17, 1890, Phonogram Blank.

1205 437,423 September 30, 1890, Phonograph.

448,781, March 24, 1891, Turning off device for Phonographs.

450,740, April 21, 1891, Phonograph Recorder.

And whereas, the Edison Phonograph Company, of West Orange, County of Essex and State of New Jersey, a corporation organized under the laws of the State of New Jersey, are desirous of acquiring an interest in the same.

1206 Now, therefore, to all whom it may concern, be it known that for and in consideration of the sum of one dollar (\$1.00) and other valuable considerations to me in land paid, the receipt of which I hereby acknowledge, I, the said Thomas A. Edison, have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the said The Edison Phonograph Company, all my right, title and interest in and to the said inventions on Phonographs and in and to the said letters patents therefor aforesaid; the same to be held and enjoyed by the said, The Edison Phonograph Company for their own use and behoof, and for the use and behoof of their legal representatives, to the full end of the term for which said letters patents are or may be granted, as fully and entirely as the

same would have been held and enjoyed by me 1207
had this assignment and sale not been made.

In testimony whereof, I have hereunto set my
hand and affixed my seal at West Orange in the
County of Essex, State of New Jersey, this eighth
day of May, nineteen hundred.

Thomas A. Edison, [Seal.]

In presence of:

J. Fred. Wherry,
Howard W. Hayes.

Recorded May 22nd, 1900.
Liber P. 66. Page 479. \$2.

**Complainant's Exhibit 117, Oct. 21, 1208
1903, J. A. S., Ex'r.**

Whereas, I, Thomas A. Edison, of Llewellyn
Park, in the County of Essex, in the State of New
Jersey, have made several certain new and useful
inventions relating to phonographs and to devices,
apparatus and methods used in connection there-
with, which inventions are described in the fol-
lowing letters patent and applications for letters
patent, to wit:

PATENTS.

No.	Dated.	
382414	May 8, 1888.	
382416	May 8, 1888	1209
382417	May 8, 1888	
382418	May 8, 1888	
382419	May 8, 1888	
382,462	May 8, 1888	

1210

APPLICATIONS.

Serial No.	Date of Filing.
252800	October 19, 1887
252964	October 21, 1887
256186	November 26, 1887
256188	November 26, 1887
256189	November 26, 1887
259895	January 5, 1888
259896	January 5, 1888
260923	January 16, 1888
262428	January 30, 1888
262431	January 30, 1888
262432	January 30, 1888
262433	January 30, 1888
1211 263048	February 4, 1888
265887	March 2, 1888
265888	March 2, 1888
265890	March 2, 1888
273038	May 7, 1888
272039	May 7, 1888
273040	May 7, 1888
276383	June 7, 1888
276384	June 7, 1888
275441	May 29, 1888
279319	July 7, 1888
279320	July 7, 1888
1212 279321	July 7, 1888
279322	July 7, 1888
279323	July 7, 1888

And whereas the Edison Phonograph Company, a corporation organized and existing under the Laws of the State of New Jersey is entitled by agreement to an assignment of the entire interest in and to the said inventions as described in said patents and applications for patents and in and to said patents and in and to any patents that may be granted upon said applications.

Now therefore to all whom it may concern, be it

known that for and in consideration of the premises and the sum of one dollar to me in hand paid, the receipt of which is hereby acknowledged, I, the said Thomas A. Edison have sold, assigned and transferred and by these presents do sell, assign and transfer unto the said the Edison Phonograph Company and its successors and assigns, the whole right, title and interest in and to the said several inventions as described by said patents and applications and in and to the said patents and in and to any patents that may be granted upon said applications, the same to be held and enjoyed by the said The Edison Phonograph Company for its own use and behoof and for the use and behoof of its legal representatives to the full end of the several terms for which said letters patent are or may be granted or for which any letters patent upon said applications may be granted as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made. And I do hereby authorize and request the Commissioner of patents to issue any and all patents that may be granted upon said applications to the said The Edison Phonograph Company, and its successors and assigns as the assignee of my entire right, title and interest in and to the same.

1213

1214

In testimony whereof I have hereunto set my hand and affixed my seal this 27th day of July, 1888.

1215

Thomas A. Edison, [Seal.]

In presence of:

Richd. N. Dyer.

Received for record Nov. 5, 1888, and recorded in Liber K-39, page 140 of Transfers of Patents.

1216

In testimony whereof I have caused the seal
[SEAL.] of the Patent Office to be hereunto af-
fixed.

[Seal; Patent Office
United States
of
America.]
Exd. F C. J.

Benton J. Hall,
Commissioner of Patents.

State of New Jersey, }
County of Warren, } ss.:

1217

Be it remembered that on this 3rd day of Sep-
tember, 1902, before me the subscriber, a notary
public within and for the State of New Jersey,
personally came Thomas A. Edison, to me known
and known to me to be the person described in and
who executed the foregoing instrument, and, I hav-
ing first made known to him the contents thereof,
he thereupon acknowledged to me that he executed
the same as his voluntary act and deed, for the
uses and purposes therein expressed.

A. Westee,
Notary Public for New Jersey.
[Seal; A. Westee,
Notary Public,
State of New Jersey.]

1218

Recorded February 27, 1903.

**Complainant's Exhibit 118, October
21, 1903; J. A. S., Exr.**

Liber K 39, page 142.

Whereas, I, Thomas A. Edison of Llewellyn
Park in the County of Essex, but formerly of Menlo
Park in the County of Middlesex State of New
Jersey, did obtain Letters Patent of the United

States for an improvement in Phonograph or Speaking Machines which Letters Patent are numbered 200521 and bear date the 19th day of February, 1878, and 1219

Whereas, I did also obtain Letters Patent of the United States for an improvement in Phonographs which Letters Patent are numbered 227679 and bear date the 18th day of May, 1880, and

Whereas, The Edison Phonograph Company a corporation organized and existing under and by virtue of the laws of the State of New Jersey is entitled by agreement to an assignment of my entire interest in and to the said Letters Patent No. 200521 and No. 227679 and in and to the inventions covered thereby. 1220

Now, therefore, to all whom it may concern, be it known, that for and in consideration of the premises and the sum of One dollar to me in hand paid, the receipt of which is hereby acknowledged, I, the said Thomas A. Edison, have sold, assigned and transferred and by these presents do sell, assign and transfer unto the said The Edison Phonograph Company and to its successors and assigns my entire right, title and interest in and to the said Letters Patent No. 200521 and 227679 and in and to the inventions covered thereby, the same to be held and enjoyed by the said The Edison Phonograph Company for its own use and behoof and for the use and behoof of its legal representatives to the full end of the term for which said Letters Patent No. 200521 and 227679 are or may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made. 1221

In Testimony Whereof, I have hereunto set my

1222 hand and affixed my seal this 27th day of July, 1888.

Thomas A. Edison. [SEAL.]

In presence of

William Pelzer.

Recorded: Nov. 5, 1888.

U. S. Patent Office, copy made Aug. 25, 1903.

**Complainant's Exhibit 119, October
21, 1903. J. A. S., Exr.**

Liber D 66, page 473.

1223 Whereas, I, Thomas A. Edison, of Llewellyn Park in the County of Essex and State of New Jersey, did obtain Letters Patent of the United States No. 713209 on the 11th day of November, 1902, for a process of duplicating phonograms;

And whereas, I am the sole and exclusive owner of said Letters Patent and the invention described therein, and of all rights and privileges thereunder;

And whereas, National Phonograph Company, a corporation organized and existing under and by virtue of the laws of the State of New Jersey, and having its principle place of business at Orange in the County of Essex in said State, is desirous of acquiring said Letters Patent and all rights thereunder;

1224 Now therefore, to all whom it may concern, be it known that for and in consideration of the sum of One dollar, lawful money of the United States, to me in hand paid, the receipt of which is hereby acknowledged, I, the said Thomas A. Edison, have sold, assigned and transferred, and by these presents do sell, assign and transfer, to the said National Phonograph Company, its successors or assigns, my entire right, title and interest in and to the aforesaid Letters Patent No. 713209 dated November 11, 1902, and the invention described

and claimed therein, together with any and all 1225
 right or rights of action, claims and demands what-
 soever, either at law or in equity, for damages or
 profits or both, which I have or may have for past
 infringement of said Letters Patent, with full
 right to the said National Phonograph Company, in
 its own name, to sue upon and collect the same for
 its own use and behoof; the same to be held and
 enjoyed by the said National Phonograph Com-
 pany, its successors or assigns, to the full end of
 the term for which said Letters Patent are or may
 be granted; as fully and entirely as the same would
 have been held and enjoyed by me had this assign-
 ment and sale not been made. 1226

In witness whereof, I have hereunto set my hand
 and seal this 16th day of December, 1902.

Thos. A. Edison.

In the presence of

Frederick C. Devonald,
 J. A. Boehm.

State of New Jersey, } ss.:
 County of Essex, }

Be it remembered, that on this 16th day of De-
 cember, 1902, before me, John F. Randolph, a No-
 tary Public, personally appeared Thomas A. Edi-
 son, who I am satisfied is the person named in who
 executed the within assignment, and I having first 1227
 made known to him the contents thereof, he ac-
 knowledged that he signed, sealed and delivered
 the same as his voluntary act and deed for the uses
 and purposes therein specified.

John F. Randolph,
 Notary Public for New Jersey.

John F. Randolph,

[SEAL.] Notary Public,
 New Jersey.

Recorded: December 18th, 1902.

U. S. Patent Office, copy made Aug. 25, 1903.

1228 **Complainant's Exhibit 120, October
21, 1903, J. A. S., Ex'r.**

Liber Z 62, page 373.

Whereas, I, Thomas A. Edison, of Llewellyn Park in the County of Essex and State of New Jersey, did obtain Letters Patent of the United States No. 622843 on the 11th day of April, 1899, for an improvement in phonographs; and

Whereas, I am the sole and exclusive owner of said Letters Patent and the invention described therein, and of all rights and privileges thereunder; and

1229 Whereas, National Phonograph Company, a corporation organized and existing under and by virtue of the laws of the State of New Jersey and having its principle place of business at Orange, in the County of Essex, in said State, is desirous of acquiring said Letters Patent and all rights thereunder;

Now, therefore, to all whom it may concern, be it known that for and in consideration of the sum of one dollar, lawful money of the United States, to me in hand paid, the receipt of which is hereby acknowledged, I, the said Thomas A. Edison, have sold, assigned and transferred, and by these presents do sell, assign and transfer, to the said National Phonograph Company, its successors or assigns, my entire right, title and interest in and to the aforesaid Letters Patent No. 622843, dated April 11, 1899, and the invention described and claimed therein, together with any and all right or rights of action, claims and demands whatsoever, either at law or in equity, for damages or profits or both, which I have or may have for past infringement of said Letters Patent, with full right to the said National Phonograph Company, in its own name, to sue upon and collect the same for its own use and behoof; the same to be held and en-

1230

joyed by the said National Phonograph Company, 1231
 its successors or assigns, to the full end of the term
 for which said Letters Patent are or may be granted,
 as fully and entirely as the same would have
 been held and enjoyed by me had this assignment
 and sale not been made.

In witness whereof, I have hereunto set my hand
 and seal this 26th day of April, 1901.

Thomas A. Edison. [SEAL.]

April, 1901.

In the presence of

W. E. Gilmore.

10c. Revenue Stamp.
 Mutilated.

1232

State of New Jersey, }
 County of Essex, } ss.:

Be it remembered that on this 26th day of
 April, 1901, before me, John F. Randolph, a
 notary public, personally appeared Thomas A. Edi-
 son, who I am satisfied is the person named in, who
 executed the within assignment, and I having first
 made known to him the contents thereof, he ac-
 knowledged that he signed, sealed and delivered
 the same as his voluntary act and deed for the uses
 and purposes therein specified.

J. F. Randolph,
 Notary Public,
 New Jersey.

1233

[Seal; John F. Randolph.

Notary Public for New Jersey.]

Recorded May 2, 1901.

U. S. Patent Office, copy made Aug. 25, 1903.

**1234 Plaintiff's Exhibit 121, Oct. 21, 1903,
J. A. S., Ex'r.**

Liber U 63, page 465.

Whereas, I, Thomas A. Edison, of Llewellyn Park, in the County of Essex and State of New Jersey, did obtain Letters Patent of the United States No. 667662 on the 5th day of February, 1901, for a process of duplicating phonograph records; and

Whereas, I am the sole and exclusive owner of said Letters Patent and the invention described therein, and of all rights and privileges thereunder; and

1235 Whereas, National Phonograph Company, a corporation organized and existing under and by virtue of the laws of the State of New Jersey and having its principle place of business at Orange, in the County of Essex in said State, is desirous of acquiring said Letters Patent and all rights thereunder;

1236 Now, therefore, to all whom it may concern, be it known that for and in consideration of the sum of one dollar, lawful money of the United States, to me in hand paid, the receipt of which is hereby acknowledged, I, the said Thomas A. Edison, have sold, assigned and transferred, and by these presents do sell, assign and transfer, to the said National Phonograph Company, its successors or assigns, my entire right, title and interest in and to the aforesaid Letters Patent No. 667662, dated February 5, 1901, and the invention described and claimed therein, together with any and all right or rights of action, claims and demands whatsoever, either at law or in equity, for damages or profits or both, which I have or may have for past infringement of said Letters Patent, with full right to the said National Phonograph Company, in its own name, to sue upon and collect the same for its

own use and behoof; the same to be held and enjoyed by the said National Phonograph Company, its successors or assigns, to the full end of the term for which said Letters Patent are or may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made. 1237

In witness whereof, I have hereunto set my hand and seal this 24th day of December, 1901.

Thomas A. Edison. [SEAL.]

In the presence of

J. W. Walker.

J. R. Schermerhorn.

State of New Jersey, }
County of Essex, } ss.:

1238

Be it remembered that on this 24th day of December, 1901, before me, John F. Randolph, a notary public, personally appeared Thomas A. Edison, who I am satisfied is the person named in, who executed the within assignment, and I having first made known to him the contents thereof, he acknowledged that he signed, sealed and delivered the same as his voluntary act and deed for the uses and purposes therein specified.

John F. Randolph,
Notary Public,
New Jersey.

1239

[Seal; John F. Randolph.

Notary Public for New Jersey.]

Recorded December 27, 1901.

U. S. Patent Office, copy made Aug. 25, 1903.

**1240 Complainant's Exhibit 122, October
21, 1903, J. A. S., Ex'r.**

Liber II 64, page 66.

Whereas, I, Thomas A. Edison, of Llewellyn Park, Orange, in the County of Essex and State of New Jersey, did obtain Letters Patent of the United States No. 604,740, on the 31st day of May, 1898, for an improvement in governors for motors; and

Whereas, I am the sole and exclusive owner of said Letters Patent and the invention described therein, and of all rights and privileges thereunder; and

1241 Whereas, National Phonograph Company, a corporation organized and existing under and by virtue of the laws of the State of New Jersey and having its principal place of business at Orange, in the County of Essex, in said State, is desirous of acquiring said Letters Patent, and all rights thereunder;

1242 Now, therefore, to all whom it may concern, be it known that for and in consideration of the sum of One dollar, lawful money of the United States, to me in hand paid, the receipt of which is hereby acknowledged, I the said Thomas A. Edison, have sold, assigned and transferred, and by these presents do sell, assign and transfer, to the said National Phonograph Company, its successors or assigns, my entire right, title and interest in and to the aforesaid Letters Patent No. 604,740, dated May 31, 1898, and the invention described and claimed therein, together with any and all right or rights of action, claims and demands whatsoever, either at law or in equity, for damages or profits or both, which I have or may have for past infringement of said Letters Patent, with full right to the said National Phonograph Company, in its own name, to sue upon and collect the same for its own

use and behoof; the same to be held and enjoyed by the said National Phonograph Company, its successors or assigns, to the full end of the term for which said Letters Patent are or may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made. 1243

In witness whereof, I have hereunto set my hand and seal this 2nd day of October, 1901.

Thos. A. Edison.

State of New Jersey, }
County of Essex, } ss.:

Be it remembered that on this 2nd day of October, 1901, before me, John F. Randolph, a Notary Public, personally appeared Thomas A. Edison, who I am satisfied is the person named in who executed the within assignment, and I having first made known to him the contents thereof, he acknowledged that he signed, sealed and delivered the same as his voluntary act and deed for the uses and purposes therein specified. 1244

J. F. Randolph,
Notary Public,
for New Jersey.

[SEAL.] John F. Randolph,
Notary Public,
New Jersey. 1245

Recorded October 4th, 1901.

U. S. Patent Office, copy made Aug. 25, 1903.

**Complainant's Exhibit 123, October
21, 1903, J. A. S., Ex'r.**

Liber P 48, page 146.

Whereas, I, Thomas A. Edison, of Orange, in the County of Essex, and State of New Jersey, did obtain Letters Patent of the United

1216 States which are described as follows: for an Improvement in the Method of Recording and Producing Sounds, dated Dec. 4, 1888, No. 393966; for an Improvement in the method of Recording and Reproducing Sounds, dated Dec. 4, 1888, No. 393967; for an Improvement in Phonograph Records, dated Dec. 4, 1888, No. 393968; for an Improvement in Phonographs, dated June 17, 1890, No. 430276; for an Improvement in Phonographs, dated June 17, 1890, No. 430278; and an Improvement in Phonograph Cutting Tool, dated Oct. 18, 1892, No. 484,583; and

1217 Whereas, I am now the sole owner of the said Letters Patent, and of all rights under the same except certain equitable rights and claims in and to said Letters Patent outstanding in the North American Phonograph Company, a corporation organized and existing under the laws of the State of New Jersey, by virtue of a certain contract between the said Thomas A. Edison and the said North American Phonograph Company, of date August 1, 1888; and

1248 Whereas the Edison Phonograph Company, a corporation organized and existing under the laws of the State of New Jersey, is desirous of acquiring the entire right, title and interest in and to the said Letters Patent, together with all legal or equitable claims or rights of action that may have accrued or now exist by reason of the said Letters Patent and the ownership thereof, by way of damages or profits for the infringement of the said patents or otherwise;

Now, therefore, to all whom it may concern, be it known that for and in consideration of the sum of Five dollars to each of the grantors herein in hand paid, the receipt whereof is hereby acknowledged, and other valuable considerations, I, the

said Thomas A. Edison, together with the said 1249
North American Phonograph Company, have sold,
assigned and transferred, and by these presents do
sell, assign and transfer unto the said Edison Phon-
ograph Company the whole right, title and interest
in and to the said Letters Patent of the United
States heretofore recited, together with all legal
or equitable claims or rights of action that may
have accrued or now exist by reason of the said
Letters Patent and the ownership thereof, by way
of damages or profits for the infringement of the
said patent or otherwise, and hereby authorize the
said Edison Phonograph Company to sue for and
collect or use the said claims, either in its own 1250
name or in the name of these grantors as fully as
they could have done if this assignment had not
been made, the same to be held and enjoyed by the
said Edison Phonograph Company for its own use
and behoof and for the use and behoof of its succes-
sors and assigns to the full end of the term for
which the said Letters Patent are or may be
granted, as fully and entirely as the same would
have been held and enjoyed by the said Thomas A.
Edison or the said North American Phonograph
Company, had this assignment and sale not been
made.

In testimony whereof, the said Thomas A. Edi- 1251
son has hereunto signed his name and affixed his
seal, and the North American Phonograph Com-
pany has caused its seal to be hereto affixed and

1252 the same to be signed by its president this 22nd day of May, 1893.

In presence of

John F. Randolph.

Thomas A. Edison. [SEAL.]

The North American Phonograph Company,

By A. O. Leare,

Vice-President.

The North American

[SEAL.] Phonograph Company.

Attest:

Cleveland Walcutt,

Secretary.

1253

Recorded: May 26th, 1893.

U. S. Patent Office, copy made Aug. 25, 1903.

**Complainant's Exhibit 124, October
21, 1903, J. A. S., Ex'r.**

Liber P 48, page 148

Whereas, I, Thomas A. Edison, of Orange, in the County of Essex, and State of New Jersey, have invented a certain new and useful improvement in phonographs, for which I made application for Letters Patent of the United States, the same being filed in the Patent Office July 30, 1888, and serially numbered 281,453; and

1254

Whereas, I am now the sole owner of the said invention and the Letters Patent to be obtained therefor, and all rights under and by virtue of the same, except certain equitable rights and claims in and to the said invention and Letters Patent to be obtained therefor outstanding in the North American Phonograph Company, a corporation organized and existing under the laws of the State of New Jersey, by virtue of a certain contract between the said Thomas A. Edison and the said North Ameri-

can Phonograph Company, of date August 1, 1888; 1255
and

Whereas the said Edison Phonograph Company, a corporation organized and existing under the laws of the State of New Jersey, is desirous of acquiring the entire right, title and interest in and to the said invention and Letters Patent to be issued therefor;

Now, therefore, to all whom it may concern, be it known that for and in consideration of the sum of Five dollars to each of the grantors herein in hand paid, the receipt whereof is hereby severally acknowledged, together with other valuable considerations, I, the said Thomas A. Edison, together with the said North American Phonograph Company, have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the said Edison Phonograph Company the full and exclusive right, title and interest in and to the said invention, as fully set forth and described in the specification prepared and executed by Thomas A. Edison on the 27th day of July, 1888, and filed herein preparatory to obtaining Letters Patent of the United States therefor, as heretofore recited, and as the same may have been from time to time amended, and we do hereby authorize and request the Commissioner of Patents to issue the said Letters Patent to the said Edison Phonograph Company, as the assignee of our entire right, title and interest in and to the same, for the sole use and behoof of the said Edison Phonograph Company and its successors and assigns. 1253

In testimony whereof, I, Thomas A. Edison, have hereunto set my hand and affixed my seal, and the North American Phonograph Company has caused its corporate seal to be hereto affixed and this in- 1257

125 strument to be signed by its vice-president this 23d day of May, 1893.

In presence of John F. Randolph.

Thos. A. Edison. [SEAL.]

The North American Phonograph Company,

By A. O. Leare,

Vice-President.

[Seal: The North American Phonograph Company.]

Attest.

Cleveland Walcutt,

Secretary.

Recorded May 26th, 1893.

1259 U. S. Patent, office copy made Aug. 25, 1903.

**Complainant's Exhibit 125, Oct. 21,
1903. J. A. S., Ex'r.**

IN CHANCERY OF NEW JERSEY.

#34

Between

WALTER CUTTING, Executor, *et al.*,

Complainants,

and

1260

THE NORTH AMERICAN PHONO-
GRAPH COMPANY,
Defendant.

On Bill, &c.
Petition of New
York Phonograph
Company.

To his Honor, Alexander T. McGill, Chancellor of the State of New Jersey, the petition of the New York Phonograph Company, a corporation organized under the laws of the State of New York, respectfully shows:

That on or about the sixth day of February,

eighteen hundred and eighty-nine, the North American Phonograph Company entered into an agreement with John P. Haines whereby the said company granted to said Haines the exclusive right for the use of the phonograph or phonograph-graphophone or phonographic, or phonograph-graphophonic supplies in the following described territory, namely, the State of New York, except the counties of New York, Westchester, Richmond, Queens, Suffolk and Kings; 1261

That your petitioner acquired said rights above mentioned from said Haines; and, by consolidation with the Metropolitan Phonograph Company on or about the 25th day of June, 1890, with the consent of the North American Phonograph Company, your petitioner, the New York Phonograph Company, acquired the exclusive right for the use of the phonograph, phonograph-graphophone, and all supplies and attachments therefor throughout the State of New York. 1262

And your petitioner further shows that on or about the first day of July, eighteen hundred and ninety-three, said the North American Phonograph Company and said New York Phonograph Company entered into a certain agreement whereby among other things it was provided that from the date of said agreement to and until the first day of July, eighteen hundred and ninety-five, the performance by the parties thereto of the covenants, stipulations and duties made incumbent upon them respectively by the terms of (1) a certain agreement bearing date the twelfth day of October, eighteen hundred and eighty-eight, made and executed between the North American Phonograph Company and the Metropolitan Phonograph Company, and (2) a certain other agreement made and executed the sixth day of February, eighteen hundred and eighty-nine, between the North American Phonograph Company and John P. Haines, 1263

- 1264 should be waived so far as any such covenants and stipulations would in any way conflict with the performance of the stipulations made in said agreement of July the first, eighteen hundred and ninety-three.

Your petitioner further shows that in said last mentioned agreement the New York Phonograph Company granted to the North American Phonograph Company the exclusive right to lease, sell and otherwise dispose of the instrument known as the phonograph, and all supplies, appliances and attachments therefor throughout the territory then operated by the New York Phonograph Company.

- 1265 Your petitioner further shows that by said agreement the business so transacted in such territory was to be at the cost and expense of the North American Phonograph Company, and that said company was to pay the New York Phonograph Company "a sum of money equal to ten per centum of the selling price to the public of all phonographs, supplies and appliances and attachments therefor, sold in, or sold to be used in the territory now covered and operated by the party of the second part (New York Phonograph Company) and a sum equal to twenty-five per centum of all the rents paid by lessees for phonographs, appliances and attachments, leased or rented in, or leased or rented to be used in said territory, and a sum equal to ten per centum of the gross amount received by the party of the first part from exhibitions and automatic machines, and from any other income derived from the business done in the State of New York, that the party of the second part, said New York Phonograph Company, would have the right to do if operating under the original agreements.
- 1266

And your petitioner further shows that thereafter during the month of August, 1894, the said the North American Phonograph Company became insolvent and that on or about the twenty-first day

of August, 1894, John R. Hardin, Esquire, was appointed receiver of said company by this honorable Court. 1267

And your petitioner further shows that since his said appointment said receiver has sold phonographs and phonographic supplies within the State of New York, to the value of over twenty thousand dollars, as your petitioner is informed and believes, in total disregard of your petitioner's rights and without making any payments to your petitioner.

And your petitioner further shows that on or about the twenty-third day of September, 1894, your petitioner informed said receiver of certain resolutions of petitioner's board of trustees, to the effect that unless said receiver proceeded to carry out the agreement last referred to, and notified your petitioner of his intention so to do, before the thirtieth day of September, 1894, your petitioner would regard said agreement as broken by the North American Phonograph Company and by said receiver, and would proceed to exercise the rights and powers belonging to it under and by virtue of all contracts existing between it and the said the North American Phonograph Company prior to September 29th, 1894. 1268

Your petitioner further shows that on the third day of October, A. D. 1894, another letter was sent to the said receiver requesting him to take immediate steps to protect the New York Phonograph Company in its exclusive right to deal in phonographs, phonograph-graphophones, and supplies in the State of New York. 1269

And your petitioner further shows that on the 15th day of March, 1895, the secretary of your petitioner in conversation with said receiver in the City of Newark, New Jersey, was informed by him that he, the said receiver, had still the right under the agreement of July first, 1893, to sell phonographs and phonographic supplies within the State

1270 of New York until the first day of July, eighteen hundred and ninety-five, but he nevertheless refused to account to your petitioner as under said agreement bound to do.

And your petitioner further shows that this statement by the said receiver was his only notification to your petitioner of what course he intended to pursue with regard to your petitioner's rights in the premises.

1271 And your petitioner further shows that since the appointment of said receiver, said receiver has violated all the contracts subsisting and in force between the North American Phonograph Company and your petitioner; that no money has been paid to your petitioner under the contract of July the first, 1893, by said receiver, and that since the reinstatement of the contracts prior thereto said receiver has violated the terms of such contracts by selling phonographs and phonographic supplies within the State of New York, the said sales being below the current market value, and that by reason of the said wrongful acts and omissions of said receiver, your petitioner has suffered great pecuniary loss and damage.

1272 And your petitioner therefore prays that said receiver be directed by this Court to pay whatever sums of money may be found by this honorable Court to be due your petitioner under and by virtue of any contract subsisting between it and the North American Phonograph Company, and that this honorable Court will settle the sum due by way of damages to petitioner by reason of the wrongful acts of said receiver, and that said receiver or those claiming under him may be enjoined from further violating such contracts as may be found to be now subsisting between your petitioner and the North American Phonograph Company. And that your petitioner may have such further or other relief in the premises as the nature of the case may re-

quire, and as shall be agreeable to equity and good conscience. 1273

And your petitioner will ever pray, &c.

ALBERT C. WALL,
Solicitor for and of
Counsel with Petitioner.

State of New Jersey, }
County of Hudson. }

Richard T. Haines, being duly sworn, deposes and says that he is the secretary of the New York Phonograph Company; that on the sixth day of February, 1889, John P. Haines entered into an agreement with the North American Phonograph Company whereby said Haines acquired exclusive rights to sell phonographs and phonographic supplies throughout the State of New York, excepting the counties mentioned in within petition; that thereafter said Haines assigned all his rights under said agreement to New York Phonograph Company; that deponent is informed and believes that by consolidation with the Metropolitan Phonograph Company the New York Phonograph Company acquired exclusive right to sell phonographs and phonographic supplies throughout the State of New York. Deponent further says that on July 1st, 1893, the North American Phonograph Company and the New York Phonograph Company agreed that said The North American Phonograph Company should have exclusive right to sell, lease and dispose of phonographs and appliances therefor throughout the territory then operated by New York Phonograph Company; that by said agreement New York Phonograph Company was to receive a sum of money equal to ten per centum of selling price to public of all phonographs and appliances therefor sold in or sold to be used in said territory, and a sum equal to twenty-five per centum of all rents paid by lessees for phonographs, appli- 1274 1275

1276 ances therefor, &c., leased, or rented, or leased to be used in said territory, and a sum equal to ten per centum of gross amount received by the North American Phonograph Company from exhibitions or automatic machines or from any other income derived from business done in the State of New York.

Deponent further says that he is informed and believes that on or about the 21st day of August, 1894, John R. Hardin, Esq., was appointed by the Chancery Court of New Jersey, as receiver of The North American Phonograph Company.

1277 Deponent further says that since his said appointment said receiver has sold phonographs and supplies therefor within said State of New York to the value, as deponent is informed and believes, of over Twenty thousand dollars, and has made no payment to New York Phonograph Company on such sales, nor in any way recognized the rights of New York Phonograph Company.

Deponent further says that the letters mentioned in within petition and dated on September 23, 1894, and October 3, 1894, respectively, were sent to the receiver and that said receiver did not make answer to the propositions and terms of said letters.

1278 Deponent further says that on or about the 15th day of March, 1895, he was informed orally by said receiver in the City of Newark, N. J., that he, the said receiver, had still the right under the agreement of July 1st, 1893, to sell phonographs and supplies therefor within the State of New York until July 1st, 1895, but that said receiver refused to account to deponent or New York Phonograph Company for any sales made. And deponent further says that no money has been paid to New York Phonograph Company by said receiver on account of any sales made by him, nor has said receiver in any way recognized any of the agreements subsisting between the North American Phonograph

Company and New York Phonograph Company, excepting as stated in the conversation between deponent and said receiver above referred to. 1279

Deponent further says that New York Phonograph Company has suffered great loss by the acts of said receiver.

RICHARD T. HAINES.

Sworn to and subscribed before me }
this 24th day of April, 1895. }

Albert I. Drayton,
Master in Chancery
of New Jersey.

Endorsed: Filed April 30, 1895.

IN CHANCERY OF NEW JERSEY. 1280

Between

WALTER CUTTING, *et al.*,
Complainants,

and

THE NORTH AMERICAN PHONO-
GRAPH COMPANY,
Defendant.

On Bill, &c.
Petition of New
York Phonograph
Company. Order
to Show Cause.

1281

Upon reading and filing the petition of New York Phonograph Company, duly verified, it is on this thirtieth day of April, A. D. 1895,

Ordered that John R. Hardin, Esq., receiver of the North American Phonograph Company, the defendant in the above entitled cause, show cause before the Chancellor, at the Chancery Chambers in the City of Jersey City on the sixth day of May next, at ten o'clock in the forenoon, why the prayer of the petition shall not be granted.

And it is further ordered that the petitioner shall

1282 within two days serve upon the said receiver a copy of the petition aforesaid and the proofs annexed hereto with a copy also of this order, which copies need not be certified.

ALEX. T. MCGILL,
C.

Endorsed: Filed May 2, 1895.

IN CHANCERY OF NEW JERSEY.

1283 Between
WALTER W. CUTTING, Ex'r, *et al.*,
Complainants,
and
NORTH AMERICAN PHONOGRAPH
Co.,
Defendant.

On Bill, &c.
Answer of Receiver to Petition
of New York Phonograph Company

The answer of John R. Hardin, receiver of the corporation defendant in the above entitled matter to the petition of the New York Phonograph Company.

1284 1. This respondent answering admits the making of the contract between the North American Phonograph Company, and the said John P. Haines, bearing date the sixth day of February, eighteen hundred and eighty-nine, but this respondent makes reference to the original agreement or a copy thereof when produced in this honorable Court for the terms and conditions of said contract.

2. And this respondent further answering says that he believes that said John P. Haines subsequently assigned his said contract to the petitioner, the New York Phonograph Company, but he leaves the petitioner to make such proof thereof as it

may be advised is necessary, and this respondent 1285
says that he has no information except from said
petition as to the consolidation of the petitioner
with the Metropolitan Phonograph Company, and
he leaves the petitioner to make such proof thereof
as it may be advised is necessary.

3. And this respondent further answering admits
that an agreement was made on the first day of
July, eighteen hundred and ninety-three, between
the said North American Phonograph Company and
the said petitioner concerning the sale of phono-
graphs and supplies therefor, but this respondent
begs leave to refer to the original agreement or a 1286
copy thereof when the same shall be produced be-
fore this honorable Court for the terms and condi-
tions thereof.

4. And this respondent further admits that this
respondent was, on or about the twenty-first day of
August, eighteen hundred and ninety-four, ap-
pointed receiver of said company by this honorable
Court, and this respondent further states that he
was on the following day, likewise appointed an-
cillary receiver of the defendant corporation by the
Supreme Court of the State of New York, and this
respondent states that he has qualified as receiver
both under the appointment by this Court and the
appointment in New York State, and that imme- 1287
diately upon his appointment he entered upon the
administration of the affairs of said company and
has disposed of the property of the said company
which he found within the State of New York and
the proceeds thereof are now on deposit with the
New York Security & Trust Company the balance
on deposit with said company at the present time
being Three thousand two hundred and eleven dol-
lars and sixty-six cents.

5. This respondent further answering says that
certain notices have been served on this respondent

- 1288 as receiver by the said petitioner, but he leaves the petitioner to make such proof thereof and of the contents of said notices as it may be advised is necessary. And this respondent expressly denies that said notices have had any effect whatsoever upon the rights and duties of this respondent as receiver of the said North American Phonograph Company. And this respondent states that he has no recollection of the conversation in said petition referred to on the fifteenth day of March, eighteen hundred and ninety-five, further than that on that day this respondent had a general conversation with one Richard T. Haines and other gentlemen concerning the Phonograph Company affairs, and this respondent denies that anything that this respondent might have said at that time can be interpreted as in any way affecting the rights or duties of this respondent as receiver aforesaid.
- 1289

6. And this respondent further answering states that the only reply that he has ever made to the petitioner as to his actions in administering his trust as receiver was in reply to a letter received from Messrs. Davis, Jessup & Pincoffs, who wrote to this respondent in behalf of said petitioner as follows:

New York City, March 25, 1895.

- 1290 John R. Hardin, Esq.,
Receiver of "The North American Phonograph Co.,"
Prudential Bldg., Newark, New Jersey.

Dear Sir:—

Our client, the New York Phonograph Company, of this city, has handed to us various contracts relating to the rights in the State of New York for selling phonographs or phonograph-graphophones, and miscellaneous phonographic supplies. It has also stated to us that you have been selling such

articles in this territory and that no payments have been made by you on account of such sales. 1291

We would feel obliged to you if you would let us know under what claim of right you have done such acts.

Yours very truly,

Davis, Jessup & Pincoffs.

To which letter this respondent replied as follows:

March 26th, 1895.

Messrs. Davis, Jessup & Pincoffs,

Counsellors at Law,

66 Broadway,

New York City.

1292

Gentlemen:

Replying to your favor 25th inst. received this morning, I beg to say that as receiver of the North American Phonograph Company I have, in the administration of the insolvent estate, disposed of certain assets of the same within the State of New York. I have done this in pursuance of what I deemed my duty as receiver to convert the assets into cash.

Your client, the New York Phonograph Company, can make application for such directions to the receiver as it may be advised is proper, under the circumstances, as to its rights in the distribution of the funds in the hands of the receiver.

1293

Yours truly,

John R. Hardin,

P.

Dictated.

7. And this respondent further answering says that he denies that he has broken any contracts or in any way prejudiced the rights of the company of which he is receiver, but that he has, in pursuance of his duty as receiver in administering the assets of an insolvent corporation, made what sales

1294 have been made of said property in the State of New York, and this respondent denies that such sales have amounted to the sum stated or that the said petitioner is entitled to any royalties on said sale.

8. And this respondent further answering says that if such contracts have been, as by the petitioner alleged, broken, then the damages to be assessed for the breach thereof, having been occasioned by the insolvency of the company, and being unliquidated damages, must be ascertained by an issue framed by one of the Justices of the Supreme Court and certified by the Clerk of the Supreme Court to this respondent as receiver, and that this Court cannot entertain the prayer of said petitioner for an ascertainment of such damages in this Court.

9. And this respondent further answering says, that all sales that have been made by this respondent other than those disposing of the assets of the North American Phonograph Company within the State of New York at the time of the appointment of this respondent as receiver, have been made from the receiver's office in the City of Newark, and that such sales have not been made within the territory of the petitioner.

1296 All of which is respectfully submitted.

John R. Hardin,

Rec'r N. A. P. Co.

Endorsed: Filed May 6th, 1895.

IN CHANCERY OF NEW JERSEY.

1297

Between

WALTER CUTTING, Executor, *et*
al.,
Complainants,

and

THE NORTH AMERICAN PHONO-
GRAPH COMPANY,
Defendant.On Bill, &c.
Petition of New
York Phonograph
Company.
Order of Refer-
ence.

1298

It is on this sixth day of May, A. D. 1895, on motion of Albert C. Wall, of counsel with petitioner,

Ordered that the matters set forth in the petition filed in the above stated cause be referred to John R. Emery, Esq., one of the Vice Chancellors, to hear the same for the Chancellor, and to report thereon to him and to advise what order or decree shall be made therein.

ALEX. T. MCGILL,

C.

Endorsed: Filed May 8, 1895.

1299

Between

WALTER W. CUTTING, Executor,
&c., *et al.*,
Complainants,

and

NORTH AMERICAN PHONOGRAPH
COMPANY,
Defendant.

On Bill, &c.
Petition of New
York Phonograph
Company.
Order.

1301

The petition of the New York Phonograph Company having been filed herein, and John R. Hardin, Esq., the receiver of North American Phonograph Company, being directed to show cause on the sixth day of May, A. D. 1895, why the prayer of said petition should not be granted;

And it further appearing that the said receiver having filed an answer herein, and the hearing of the matters set forth in the said petition having been referred to his Honor, John R. Emery, one of the Vice-Chancellors, and said cause coming on to be heard on the seventeenth day of May, A. D. 1895, and proof being submitted in support of the allegations in said petition, and counsel being heard on behalf of the said petitioner, and the receiver appearing in his own behalf;

1302

And it further appearing that his Honor, John R. Emery, did on or about the nineteenth day of January, 1896, file certain conclusions herein, to the effect that said petitioner was entitled to a royalty of ten per centum on sales of phonographs and phonographic supplies by the receiver, as alleged in said petition;

And it further appearing that the amount due for said royalties as stated by the solicitor of the

petitioner and the said receiver is the sum of Sixteen hundred dollars, besides costs herein to be taxed, 1303

And it further appearing that the said petitioner has a claim against the said receiver for damages alleged on account of phonographs and supplies sold by said receiver to persons in New York State, or for use in New York State, and that the petitioner has offered to release the said claims if the above mentioned royalties are paid to it;

It is on this 21st day of April, A. D. 1896,

Ordered that, upon the receipt of a release from the said petitioner to him of all claims for said royalties and said alleged damages, John R. Hardin, Esquire, receiver aforesaid, do pay to the said petitioner or its solicitor, Albert C. Wall, the sum of Sixteen hundred dollars forthwith, besides said petitioner's costs in this matter to be taxed. 1304

ALEX. T. MCGILL,
C.

Respectfully advised,

John R. Emery,
Vice-Chancellor.

We consent to the above order.

HAYES & LAMBERT,
Solrs. of Thomas A. Edison
and National Phonograph Co.

I consent to above. 1305

JOHN R. HARDIN,
Rec'r N. A. P. Co.

Endorsed: Filed April 28, 1896.

I, Edward C. Stokes, Clerk of the Court of Chancery of the State of New Jersey, the same being a Court of Record, do hereby certify that the foregoing are true copies of the petition of New York Phonograph Company, filed April 30th, 1895; order to show cause, filed May 28, 1895; answer of receiver to petition of New York Phonograph Company, filed May 6th, 1895; order of reference, filed

1306 May 8, 1895, and order to pay, filed April 28, 1896, in the cause wherein Walter W. Cutting, Executor, &c., and another are complainants and North American Phonograph Company is defendant, now on the files of my office.

In Testimony Whereof, I have hereto set my hand and affixed the seal of said [SEAL] Court, at Trenton, this twenty-sixth day of August, A. D. nineteen hundred and three.

EDWARD C. STOKES,
Clerk.

1307 I, William J. Magie, Chancellor of the State of New Jersey, do hereby certify that Edward C. Stokes, whose name is subscribed to the above certificate, was, at the date thereof, and now is, the Clerk of the Court of Chancery of the State of New Jersey; that said attestation is in due form, that the seal thereto annexed is the seal of said Court, and that the signature of the said Edward C. Stokes is in his own proper handwriting.

Witness my hand at the City of Trenton this twenty-sixth day of August, A. D. nineteen hundred and three.

W. J. MAGIE.

1308 Note.—This certificate is made pursuant to an act of Congress (Rev. Stat. U. S. 1875, Sec. 905, p. 170).

Complainant's Exhibit 128, Oct. 21, 1309
J. A. S., Ex'r.

IN CHANCERY OF NEW JERSEY.

Between

THE NEW JERSEY PHONOGRAPH
COMPANY,
Complainant,

and

THE NORTH AMERICAN COMPANY
and the Automatic Phono-
graph Exhibition Company,
Defendants.

1310

On filing the answer and cross bill of the North American Phonograph Company and affidavits,

It is ordered that the complainant show cause on Monday December fourth next at ten o'clock in the forenoon at the Chancellors Chambers in Jersey City, why an order for injunction and receiver should not be made as prayed in said cross bill, and that meanwhile the complainant be enjoined from selling or leasing phonographs or permitting the same to be sold or leased unless the same have attached securely thereto a plate declaring that the same are leased or sold under restriction not to be used except in the State of New Jersey, dated November 24, 1893, and that copies which need not be certified of this order and of the bill and affidavits

1311

1312 (unless already served) be served upon the complainant's solicitor forthwith.

ALEX. T. MCGILL,
C.

Respectfully advised,
H. C. Pitney,
V. C.

Endorsed: Filed Nov. 25, 1893.

IN CHANCERY OF NEW JERSEY.

Between

1313 THE NEW JERSEY PHONOGRAPH
COMPANY,
Complainant,

and

THE NORTH AMERICAN PHONO-
GRAPH COMPANY and the Auto-
matic Phonograph Exhibition
Company,
Defendants.

On Bill Filed Au-
gust, 1892.
Order.

1314

The defendants having filed their answers and cross bills in the above stated causes, together with affidavits and order to show cause having been made as against the complainant, why an injunction should not issue against them and a receiver to be appointed as prayed for in said cross bill, and argument having been had thereon, and the Court having taken time to consider the same,

It is now, on this seventh day of February, eighteen hundred and ninety-four, ordered by Alexander T. McGill, Chancellor of the State of New Jersey, that the restraining order granted in this cause on the twenty-fourth day of November, eighteen

hundred and ninety-three, and filed on the twenty-
fifth day of said November upon the prayer of the
defendant in its cross bill, be continued until the
final hearing in this cause, or until the further or-
der of the Court. 1315

ALEX. T. MCGILL,
C.

Respectfully advised

H. C. Pitney,
V. C.

Endorsed: Filed Feb. 8, 1894.

I, Edward C. Stokes, Clerk of the Court of Chan-
cery of the State of New Jersey, the same being a
Court of Record, do hereby certify that the forego-
ing is a true copy of order to show cause and re-
straining order, filed Nov. 25, 1893, and order for
continuance, filed Feb. 8, 1894, in the cause wherein
The New Jersey Phonograph Company is complain-
ant and the North American Phonograph Co. *et*
als., are defendants, now on the files of my office. 1316

In testimony whereof, I have hereto set my
hand and affixed the seal of said Court,
[SEAL.] at Trenton, this twenty-fourth day of
August, A. D., nineteen hundred and
three.

EDWARD C. STOKES,
Clerk. 1317

I, William J. Magie, Chancellor of the State of
New Jersey, do hereby certify that Edward C.
Stokes, whose name is subscribed to the above cer-
tificate, was, at the date thereof, and now is, the
Clerk of the Court of Chancery of the State of New
Jersey; that said attestation is in due form, that
the seal thereto annexed is the seal of said
Court, and that the signature of the said Edward
C. Stokes is in his own proper handwriting.

Witness my hand at the City of Trenton, this

1318 twenty-fourth day of August, A. D., nineteen hundred and three

W. J. MAGIE.

Note—This certificate is made pursuant to an act of Congress (Rev. Stat. U. S. 1875, Sec. 905, p. 170).

**Complainant's Exhibit 127, Oct. 21,
1903, J. A. S., Ex'r.**

IN CHANCERY OF NEW JERSEY.

1319 Between
John R. Hardin, Receiver of the
North American Phonograph
Company,
Complainant,

and

The Edison Phonograph Works,
et als.,
Defendants.

On Bill, &c.,
Order for Injunction.

1320 This matter coming on to be heard upon bill of complaint and affidavits, and upon affidavits made in reply thereto, under an order to show cause why an injunction should not issue pursuant to the prayer of said bill and Charles J. Roe, appearing for the receiver, and Howard W. Hayes, of counsel with the defendants, having been heard in opposition:

It is, thereupon, on this twenty-first day of October, eighteen hundred and ninety-five, on motion of Charles J. Roe, of counsel with the complainant, ordered that an injunction do issue restraining the defendant, The Edison Phonograph Works from manufacturing for, or selling to any

person or persons or corporations other than the 1321
 North American Phonograph Company, or John R.
 Hardin as receiver of the said The North American
 Phonograph Company, and any phonographs or
 supplies therefor for use within the United
 States and Canada; and that the said defendant,
 Thomas A. Edison, be restrained from purchasing
 phonographs or supplies therefor for use in con-
 nection with the kinetoscope and in the combined
 instrument known as the kinetophone, for use or
 sale in the United States and Conada from the said
 Edison Phonographs Works, until the further or-
 der of this Court.

And it is further ordered that this order is made 1322
 upon the terms that if the defendant appeals there-
 from, that the complainant shall, if so desired by
 the defendants, consent to a hearing being had on
 such appeal at the next regular term of the Court
 of Errors and Appeals.

ALEX. T. MCGILL,
 C.

Respectfully Advised,
 John R. Emory, Vice Chancellor.
 Endorsed: Filed Oct. 22, 1895.

I, Edward C. Stokes, Clerk of the Court of Chan-
 cery of the State of New Jersey, the same being a 1323
 Court of Record, do hereby certify that the forego-
 ing is a true copy of order for injunction, filed Oct.
 22, 1895, in the cause wherein John R. Hardin, re-
 ceiver of the North American Phonograph Company
 is complainant and The Edison Phonograph Works,
et als., are defendants, now on the files of my office.

In testimony whereof, I have hereto set my
 hand and affixed the seal of said Court,
 [SEAL.] at Trenton, this twenty-fourth day of
 August, A. D. nineteen hundred and
 three.

EDWARD C. STOKES,
 Clerk.

1324 I, William J. Magie, Chancellor of the State of New Jersey, do hereby certify that Edward C. Stokes, whose name is subscribed to the above certificate, was at the date thereof, and now is, the Clerk of the Court of Chancery of the State of New Jersey; that said attestation is in due form, that the seal thereto annexed is the seal of said Court, and that the signature of the said Edward C. Stokes is in his own proper handwriting.

Witness my hand at the City of Trenton, this twenty-fourth day of August, A D. nineteen hundred and three.

W. J. MAGIE.

1325 Note—this certificate is made pursuant to an act of Congress (Rev. Stat. U. S. 1875, Sec. 905, p. 170).

**Complainant's Exhibit 128, Oct. 31,
1903, J. A. S., Ex'r.**

IN CHANCERY OF NEW JERSEY

Between

WALTER CUTTING, Executor, *et*
al.,
Complainants,

1326

and

NORTH AMERICAN PHONOGRAPH
COMPANY,
Defendant.

A petition having been filed in a suit pending in this Court, between the Edison United Phonograph Company, complainant, and the Edison Phonograph Works and the North American Phonograph Company, defendants, setting forth an

agreement between Thomas A. Edison, the North American Phonograph Company, and one Jesse H. Lippincott, by which it was agreed that the North American Phonograph Company should not sell phonographs for use in countries other than the United States and Canada, nor interfere in any way with the foreign business of said Edison; and also a subsequent agreement, made March eleventh, eighteen hundred and ninety, by which said Edison assigned all his interest in Letters Patent for phonographs to the Edison United Phonograph Company, and agreed that he would not sell phonographs for use in any other countries than the United States and Canada, nor interfere in any way with the foreign business relating to phonographs; and that by an agreement of the same date the Edison Phonograph Works, which had exclusive right to manufacture phonographs and supplies therefor, agreed with the Edison United Phonograph Company that it would not manufacture any phonograph machines, supplies or appliances, for sale or use in any part of the world except the United States and Canada, and would use its best endeavors, either by agreements or suitable marks, or otherwise, to prevent any such machines, supplies or appliances, which it should manufacture for sale or use in the United States and Canada, from being sold or used elsewhere; and praying that John R. Hardin, who was appointed receiver of the North American Phonograph Company, an insolvent corporation, by an order made in this suit, might be made a party defendant to the said suit by the Edison United Company, and might be required, by the direction of this Court, to sell phonograph machines and supplies only in such way as to show that they are not to be used in other countries except the United States and Canada, and make such agreements with purchasers as would

1327

1328

1329

1330 reasonably provide against the shipment of the same to foreign countries:

And an order of this Court having been made on the twenty-ninth day of August, amended on the thirty-first day of August, eighteen hundred and ninety-four, requiring the said receiver to show cause why he should not be made a party to that suit, and directing him in the meantime not to sell any phonographs or supplies therefor without distinctly marking the same so as to indicate that they are not to be sent to or used in any countries other than the United States and the Dominion of Canada, and also without requiring the purchaser

1331 to make a promise, in writing, not to sell or use such machines or supplies outside of the territory of the United States and Canada, and not to sell them to others to be by them sold for sale or use outside of the territory of the United States and Canada:

And upon the hearing of the said order to show cause, this Court having made an order directing that said receiver be made a party to the said suit by the Edison United Phonograph Company, but vacating the said restraining order and direction to the receiver, to the end that an order conforming to the said agreement made with Thomas A. Edison by the North American Phonograph Company might be made in this suit in which the receiver was appointed:

1332

It is, thereupon, on this twentieth day of September, eighteen hundred and ninety-four, ordered and directed that the said John R. Hardin, receiver, in making sales of any phonographs, or phonographic supplies or appliances, whether at public or private sale, shall, before the delivery of the goods, take from the purchaser a receipt, in writing, showing the number of the machine and the nature and quantity of the supplies and appliances, and also giving notice that such machines, supplies and

appliances are sold subject to the provisions and obligations of an agreement, in writing, made August first, eighteen hundred and eighty-eight, between Thomas A. Edison and the North American Phonograph Company and Jesse H. Lippincott, by the seventh paragraph of which it was provided as follows: "The North American Company shall not sell phonographs for use in countries other than the United States and Canadas, nor interfere in any way with the foreign business of the said Edison. The said Edison is also to have the exclusive right in perpetuity to manufacture phonographs and all supplies therefor for export." 1333

ALEX. T. MCGILL, 1334
C.

Respectfully advised

A. V. Van Fleet,

V. C.

Endorsed: Filed Sep. 21, 1894.

IN CHANCERY OF NEW JERSEY.

Between
WALTER W. CUTTING, Exr., *et*
al.,

Complainants,

and

NORTH AMERICAN PHONOGRAPH
Co.,

Defendants,

On Bill, &c.

1335

The receiver heretofore appointed in the above entitled cause having, after notice to the creditors and stockholders of the defendant company, presented to the Chancellor his petition on the eighth

- 1336 day of April, eighteen hundred and ninety-five, reporting that he had received an offer of One hundred and twenty-five thousand one hundred dollars for the balance of the assets of said defendant corporation remaining in his hands, from Thomas A. Edison, and that said bid had been made subject to confirmation by the Court of Chancery and asking the advice of the Court thereon, and on said eighth day of April, objection having been made to the acceptance of said bid before the Chancellor, and the matter having been regularly continued until the fifteenth day of April then next, and on that day Michael W. Nolan and Charles A. Boston having
- 1337 filed petitions herein in opposition to the acceptance of said bid, and the matter having been then further continued until the seventeenth day of April then next, at which time it was further continued until the twenty-ninth day of April then next before the Chancellor in his Chambers in the City of Jersey City, and at that time the said Michael W. Nolan and Charles A. Boston having filed supplemental petitions herein, and petitions having also been filed in behalf of Henry Stern and others in further opposition to the acceptance of said bid, and on the same day a petition of Thomas A. Edison having been filed herein, and the Court having
- 1338 been informed by said petition of Thomas A. Edison that said Edison is willing to waive any rights which he might have acquired by the sale of certain stock of the Edison Phonograph Company, in the month of July prior to the appointment of the receiver, pursuant to the terms of a pledge of said stock made by the said North American Phonograph Company to the said Thomas A. Edison, to secure a note of said Company to said Edison in the sum of Seventy-eight thousand five hundred eighteen 37-100 dollars which sale under said pledge had been objected to by the petitioners hereinbefore

mentioned, and said Edison having further expressed his willingness by said petition that the receiver herein might sell said stock as an asset of said company subject to said Edison's pledge, and the receiver having on said last mentioned day filed a supplemental petition herein, and the Court having heard Mr. R. Wayne Parker, of counsel for said Michael W. Nolan; Mr. E. Q. Keasbey of counsel for said Henry Stern, Mr. Charles A. Boston, in his own behalf, Mr. Frederick H. Lum and Mr. Richard N. Dyer, of New York, of counsel with said Thomas A. Edison, and the said receiver, and the Court being of the opinion that at this time said bid of Thomas A. Edison should not be accepted, and that the said receiver should sell said property of the North American Phonograph Company at public sale after compliance on his part with the directions of this order,

1339

1340

It is thereupon, on this sixth day of May, instant, on motion of John R. Hardin, receiver of the said defendant corporation, ordered that the said receiver be and he is hereby directed not to accept the said bid of Thomas A. Edison reported by him to this Court for confirmation, and to return to the said Thomas A. Edison the sum of One thousand five hundred dollars paid by him to the said receiver as a deposit on said bid to bind the bargain.

And it is further ordered that the said receiver do, with all convenient speed, proceed to procure from Mr. Thomas A. Edison an assignment of all of the patents for phonographs and improvements thereon and appliances therefor, which under the contracts between the said Edison and the said North American Phonograph Company the said Edison has agreed to assign to the said North American Phonograph Company, and if the said Edison shall decline on request to make said assignment to said receiver as directed, to undertake.

1341

1342 such proceedings in this Court or elsewhere as he may be advised and satisfied may be necessary to protect the rights of his trust; and also that he obtain from said Edison a formal waiver in writing of all interest derived in virtue of the sale aforesaid of the aforementioned seized stock.

And the said receiver is further directed when he shall have obtained an assignment of said patents, and said waiver to advertise all of the assets of the said corporation not heretofore disposed of by him for sale at public auction to the highest bidder, subject, however, to confirmation by this Court, and in the meantime the said receiver shall continue to realize on the assets of said corporation in the manner heretofore pursued by him and reported to this Court by the receiver's petitions filed herein.

ALEX T. MCGILL,
C.

Endorsed: Filed May 10, 1895.

I, Edward C. Stokes, Clerk of the Court of Chancery of the State of New Jersey, the same being a Court of Record, do hereby certify that the foregoing is a true copy of order giving directions to receiver, filed Sept. 21, 1894, and order refusing bid and for further directions to receiver, filed May 10, 1895, in the cause wherein Walter W. Cutting, Executor, *et al.*, are complainants and North American Phonograph Co. is defendant, now on the files of my office.

In testimony whereof, I have hereto set my hand and affixed the seal of said Court.
[SEAL.] at Trenton, this twenty-fourth day of August, A. D., nineteen hundred and three.

EDWARD C. STOKES,
Clerk.

I, William J. Magie, Chancellor of the State of New Jersey, do hereby certify that Edward C.

Stokes, whose name is subscribed to the above certificate, was, at the date thereof, and now is, the Clerk of the Court of Chancery of the State of New Jersey; that said attestation is in due form, that the seal thereto annexed is the seal of said Court, and that the signature of the said Edward C. Stokes is in his own proper handwriting. 1345

Witness my hand at the City of Trenton this twenty-fourth day of August, A. D., nineteen hundred and three.

W. J. MAGIE.

Note—This certificate is made pursuant to an act of Congress (Rev. Stat. U. S. 1875, Sec. 905, p. 170). 1346

Complainant's Exhibit 129.

Essex County, ss.:

Thomas A. Edison, being duly sworn, according to law on his oath, says; I am the inventor of the instrument known as the phonograph, and am one of the persons named in the annexed bill of complaint; I know of my own knowledge of the transaction attending the organization of the corporations known as the Edison Phonograph Company, the Edison Phonograph Works and The North American Phonograph Company, all of which are mentioned in the said bill; I have in my possession a certified copy of the certificate of organization of The North American Phonograph Company; this company, as it appears by the said certificate, was organized on July fourteenth, eighteen hundred and eighty-eight, by certificate dated on that day and filed in the office of the Secretary of State two days afterwards; the objects for which the said company was formed are correctly set out in said bill; the total capital stock of the said company authorized by the said certificate was Six million six hundred thousand dollars, divided into sixty- 1347

1348 six thousand shares of the par value of One hundred dollars each, and the names of the parties who signed the certificate are correctly given in said bill; shortly after the filing of the said certificate the said company was organized by the incorporators and almost contemporaneously with its organization I became a stockholder in the said company; I was elected one of its directors; I have held the office of director in that company from that time until the present, and I am now one of its directors; I was elected president of the company in the month of , eighteen hundred and , and I held the office of president until the month of January, eighteen hundred and ninety-four when I sent to the company my written resignation of the office; the resignation was never accepted, and I have never since that time attended any of the meetings of the Board of Directors.

In the month of March, eighteen hundred and ninety-three the said company filed a list of its officers and directors in the office of the Secretary of State, as set out in the second paragraph of the said bill; since that time I have signed no such certificate and think that none has been signed.

1350 Prior to the organization of The North American Phonograph Company I had caused to be organized the Edison Phonograph Company, and I granted to that company the sole and exclusive right to use my invention of the phonograph in consideration of the issue of the total capital stock of the company to me; the total capital stock of the company was One million two hundred thousand dollars, and at the time of the organization of The North American Phonograph Company I held the whole of this stock excepting one hundred and fifty shares; on June twenty-eighth, eighteen hundred and eighty-eight, I made an agreement with Jesse H. Lippencott, who was then contemplating the or-

ganization of The North American Phonograph Company and was its principal promoter, by which I agreed that I would sell and deliver to the said Lippencott the entire capital stock of the Edison Phonograph Company except the said one hundred and fifty shares, for the sum of Five hundred thousand dollars; I subsequently transferred my stock in that company either to Lippencott or to The North American Phonograph Company in execution of my said contract. 1351

Prior to the organization of The North American Phonograph Company there was in existence a corporation known as the American Graphophone Company, having its headquarters in the City of Washington, in the District of Columbia; that company granted to the said Jesse H. Lippencott the sole and exclusive right to use the patents owned by it. 1352

In the organization of The North American Phonograph Company the parties who subscribed to its capital stock, the sum of Forty thousand dollars, paid in their several subscriptions in cash; the remainder of the stock, Six million five hundred and sixty thousand dollars, was issued to the said Jesse H. Lippencott in consideration of the transfer by him to that company of the stock of the Edison Phonograph Company which I had sold him and the rights which he had acquired from the American Graphophone Company; I have in my possession the contract made between The North American Phonograph Company and the Edison Phonographic Works mentioned in the sixth paragraph of the said bill of complaint; said contract provided, among other things that The North American Phonograph Company granted to the Edison Works the sole and exclusive right to manufacture the phonograph and the various devices and apparatus used and to be used in connection therewith and 1353

1354 the supplies therefore in perpetuity, and agreed that it would not authorize the manufacture thereof by any other person or corporation; all the phonographs and appliances appertaining thereto which have been used by The North American Phonograph Company in its business since the date of its organization have been made by the Edison Phonograph Works; the said The North American Phonograph Company has never manufactured any of the said instruments and never owned or controlled any factory or works in which the same could be manufactured.

1355 The business which was done by The North American Phonograph Company during the early period of its existence was the sale and leasing to individuals and corporations of phonographs and phonograph graphophones, and that for some little time after its organization it did a good business and its prospects for future success were very good, but in a short time it was demonstrated that the instruments as manufactured and sold by the said company had little or no practical or commercial value; they were generally used as curiosities to reproduce instrumental and vocal music and other vocal and articulate sounds, and were set up in public places for purposes of amusement and exhibition; from this use of the said instrument the

1356 company at first derived some revenue, but as soon as the novelty of the instrument wore off and the public became familiar with its capacity the income of the company diminished so that in the early part of the year eighteen hundred and ninety-two the company found itself in financial difficulties and unable to meet all the obligations which it had assumed; it thereupon authorized the issue of the bonds mentioned and set out in the eighth paragraph of said bill; the total issue of these bonds was Three hundred thousand dollars, three hun-

dred bonds of the denomination of One thousand dollars each; they were dated May first, eighteen hundred and ninety-two and payable in ten years with interest at six per cent. payable semi-annually on May first and November first of each year; it was provided in those bonds and in each of them that in case the said company should make default in the payment of the interest accruing upon any of the said bonds for thirty days after such interest should have become due and payable and had been duly demanded, then and in such case it should be lawful for the holders of a majority of all the said bonds outstanding, by written notice to the company, signed by them, to declare the principal of all the said bonds to be thereafter immediately payable, and that upon such default and the giving of such notice the principal and all arrears of interest on said bonds should be forthwith due and payable. I am the holder of two hundred and twenty of these bonds, aggregating the sum of Two hundred and twenty thousand dollars; the interest which accrued on these bonds on the first day of May, eighteen hundred and ninety-four, was not paid at maturity, and on the eighteenth day of June, eighteen hundred and ninety-four, I wrote a letter to the said company of which the following is a copy, "I hereby demand payment of the sum of \$6,600, interest on the bonds of your company which became due and payable on the first day of May last past. The bearer, W. E. Gilmore, is hereby authorized to receive payment of the said interest for me," this letter was signed by me and sent by Mr. Gilmore to the said company. On the same day I received a reply thereto of which the following is a copy: "Jersey City, N. J., June 18, 1894; Thomas A. Edison, Esq., Orange, N. J. Dear Sir: We are in receipt of your favor bearing date 18 inst., and in reply thereto beg to say that it is impossible to com-

1357

1358

1359

1360 ply with your demand for the payment of the sum of \$6,600 interest on the bonds of this company standing in your name this date, and registered on the books of the company as such at this date, and said interest being due on May 1, 1894, and still unpaid. Yours truly, The North American Phonograph Co. Scot Tremain, Treasurer." Since that time no portion of the said interest has been paid to me. On the sixth day of August, eighteen hundred and ninety-four I joined with Charles B. Carman and the complainants in this suit in a declaration that the principal of the said bonds was immediately due and payable, a copy of said declaration is hereto annexed and made part hereof; the persons who signed the said declaration own in the aggregate Two hundred and sixty thousand dollars out of the total issue of three hundred thousand dollars of the said bonds.

1361

1362

The North American Phonograph Company in the course of its business became indebted to me in the sum of seventy-eight thousand five hundred and eighteen dollars and thirty-seven cents, in addition to the amount owing to me on my bonds, and on April first, eighteen hundred and ninety-four, the said company gave me its promissory note for that amount, payable ten days after demand, at No. 44 Broad street in the City of New York, with interest at six per cent. The said company had become possessed of the total capital stock of the Edison Phonograph Company, aggregating twelve thousand shares, and it pledged the whole thereof to me as collateral security for the payment of the said note; I have many times demanded the payment of the money due on that note, but the same has never been paid to me; and on the thirteenth day of August, eighteen hundred and ninety-four, after due notice to the said company, and public advertisement, the said stock was sold by me at the Court

House in the city of Jersey City, in the County of Hudson, for the sum of Ten thousand dollars; the remainder of the moneys secured by the said note and stock have never been paid. 1363

I am the president of the Edison Phonograph Works. The North American Phonograph Company is indebted to the Edison Phonograph Works in the sum of about thirty-six thousand dollars on open book account as set out in the tenth paragraph of the said bill; the Edison Phonograph Works have made all reasonable efforts to collect the said moneys, have many times made demands upon the North American Phonograph Company therefor, but have not been able to secure payment thereof, and that the same is now owing to the said Edison Phonograph Works. 1364

I am familiar with the property owned by The North American Phonograph Company; it consists entirely, outside of its rights in the inventions of phonographs and phonograph-graphophones; their value at the present time to any one going into the business of selling and leasing phonographs would not exceed twenty-five thousand dollars; it is mostly old stock made three years or more ago, some of the instruments have been used and need repairs before they can be put upon the market, and in fact there are very few of the instruments which can be placed on the market at the present time without more or less work being first done upon them. 1365

The value of the rights and licenses which the North American Phonograph Company acquired as is set forth in the said bill from the American Graphophone Company which company has repudiated the same is problematical. I don't think that their value can be estimated at the present time; their value depends upon many contingencies, the practical application thereof is subject to many conditions, and the making of a

1366 commercial success of the sale or leasing of the instrument depends upon correct business methods the necessity of a large money capital and upon improvements to adapt the instrument to the needs and requirements of the public, and in my opinion these rights in the hands of the present company are of no value whatever at the present time and cannot be made available as a valuable asset for the payment of the company's debts.

I am familiar with the whole history of The North American Phonograph Company. It was the original design of the company and its officers and directors that the principal portion of its business should consist of manufacturing and owning and leasing phonographs and phonograph graphophones to individuals and corporations, and to this end the said company procured the said Edison Phonograph Works to manufacture a large number of phonographs; these were delivered to The North American Phonograph Company and that company succeeded in leasing a number of them and obtaining some revenue therefrom, but the demand of the public for such an instrument is very limited, and it was more than supplied by the large number of phonographs which the said company had had constructed; for the past three years or more the said company has had no new phonographs built, and it has now practically ceased leasing the instruments, the principal business which the company is now engaged in is the repairing and re-constructing of the old phonographs and the selling of them to individuals and corporations at such prices as they are able to get; the sales of the company of these old machines are not sufficient to pay the necessary running expenses of the business and the company is and for many months has been running at a loss; in case this business is allowed to continue there will in a short time be nothing left for its creditors;

1367

1368

it is now using up its capital; it has an expensive office in the city of New York and has been paying large amounts in salaries, and is expensively conducted; the company is daily running deeper into debt. 1369

The said company is insolvent; it has not sufficient funds to carry on its ordinary business, and in the condition of the finances of the country, considering the fact that the phonograph as now used and exploited is not a necessity, it is very uncertain whether the business can be made to pay its expenses for some time to come; its further prosecution by the said company would necessarily tend to the sacrifice of the rights of its creditors. 1370

Thomas A. Edison.

Sworn and subscribed to before me this }
fifteenth day of August, 1894. }

Wm. D. Gibby,
Master in Chy of N. J.

I, Edward C. Stokes, Clerk of the Court of Chancery of the State of New Jersey, the same being a Court of Record, do hereby certify that the foregoing is a true copy of affidavit of Thomas A. Edison attached to and a part of bill of complaint, filed Aug. 16, 1894, in the cause wherein Walter Cutting, Exr., & al., are complainants and The North American Phonograph Co., is defendant, now on the files of my office. 1371

In testimony whereof, I have hereto set my hand and affixed the seal of said Court,
[SEAL.] at Trenton, this fifteenth day of December, A. D., nineteen hundred and three.

EDWARD C. STOKES,
Clerk.

I, William J. Magie, Chancellor of the State of New Jersey, do hereby certify that Edward C. Stokes, whose name is subscribed to the above cer-

1372 tificate, was, at the date thereof, and now is, the Clerk of the Court of Chancery of the State of New Jersey; that said attestation is in due form, that the seal thereto annexed is the seal of said Court, and that the signature of the said Edward C. Stokes is in his own proper handwriting.

Witness my hand at the City of Trenton this fifteenth day of December, A. D., nineteen hundred and three.

W. J. MAGIE.

Note—This certificate is made pursuant to an act of Congress (Rev. Stat. U. S. 1875, Sec. 905, p. 170).

1373

[2474]

1374

U. S. Circuit Court,
Southern District of New York.

N. Y. PHONOGRAPH CO.	}
vs	
NATIONAL PHONOGRAPH CO. <i>et al.</i>	

COMPLAINANT'S EXHIBIT No. 132.

"Edison Patents."

April 7, 1904.

S. M. H.
Exr.

U. S. Circuit Court, Southern District of New York,
Filed May 2, 1905, John A. Shields, Clerk.

1133

(No Model.)

T. A. EDISON.

BURNISHING ATTACHMENT FOR PHONOGRAPHS.

No. 382,414.

Patented May 8, 1888.

Fig. 1.

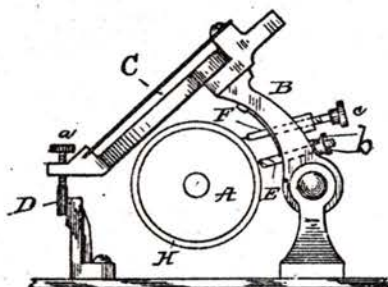


Fig. 2.

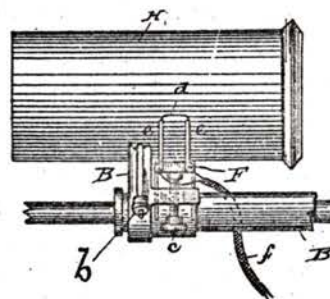


Fig. 3.

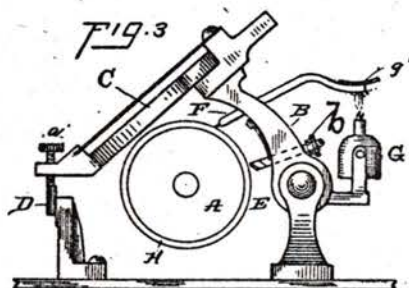
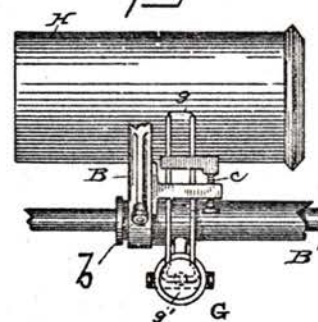


Fig. 4.



Witnesses.
E. C. Howard
William R. Rye

Inventor.
Thomas A. Edison
 By his Attorneys
Dyer & Seely

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

BURNISHING ATTACHMENT FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 382,414, dated May 8, 1888.

Application filed November 26, 1887. Serial No. 236,190. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 742,) of which the following is a specification.

The object I have in view is to improve the articulation of the phonograph. This I find can be accomplished by burnishing with a heated burnishing-tool the wax or wax-like surface of the phonogram-blank. The effect is to smooth out the tool-marks produced in turning the surface to a true cylinder, and to reduce greatly the scratching noise heard in the recorder, and consequently made a part of the record which is reproduced by the reproducer.

I provide the phonograph itself with the heated burnishing-tool as well as with the cutting-tool, the former acting after the latter upon the surface. Both tools are adjustably carried by the holding-arm or guide-sleeve of the phonograph, so that they can be brought into proper relation with the surface and made to work at the same time upon it. The burnishing-tool may be a piece of platinum wire heated by the electric current, or it may be a piece of wire which is heated by a small alcohol-lamp and conducts the heat to the burnishing-point of the tool.

In the accompanying drawings, forming a part hereof, Figure 1 is an end elevation of the phonogram-cylinder and phonogram-blank with the holding-arm and the cutting and burnishing tools carried thereby; Fig. 2, a top view with the holding-arm broken away; Fig. 3, a view similar to Fig. 1, showing a modified form of the heated burnishing-tool; and Fig. 4, a view similar to Fig. 2, showing the modified form of burnishing-tool.

A is the revolving phonogram-cylinder.

B is the traveling holding-arm mounted on the guide-sleeve B' and carrying the recorder and reproducer, the arm and sleeve being fed laterally by a lead-screw on the shaft of the phonogram-cylinder, as will be well understood. The frame C, carried by the arm B, rests upon the guide-rest D, it being adjustably supported thereon by a set-screw, a.

Through the arm B passes the shank of the

cutting-tool E, adjustable by means of the nut b. There is also carried by an extension on the arm B the heated burnishing-tool F. This is adjustable by means of the screw c, and acts upon the phonogram-blank surface after the cutting-tool.

In Figs. 1 and 2 the burnishing-tool is composed of a platinum strip or wire, d, to which heavier wires or rods e lead. The rods e are connected by a flexible cord, f, with a battery for supplying current for heating the strip or wire d. The strip or wire d is heated to a dull red, and is made to bear lightly on the wax or wax-like surface of the phonogram-blank.

In Figs. 3 and 4 the heat is produced by a small alcohol-lamp, G, which is carried by the guide-sleeve B' and travels with the holding-arm. The burnishing-tool in this latter arrangement may be a silver or aluminium wire, g—say one-eighth of an inch in diameter and reduced to one thirty-second of an inch at its burnishing end, such end being heated by conduction from the lamp. The end of the wire g above the flame of the lamp may carry a plate, g', so that the tool can be adjusted without disturbing the influence of the lamp. The wire, except at the flame and the burnishing end, may be covered by a poor conductor of heat, such as asbestos.

The phonogram-blank H is a cylinder slipping over the phonogram-cylinder A. It has a surface of wax or a wax-like material on a base of harder material—such as plaster-of-paris. The phonogram-blank may be turned and burnished before being placed on the phonogram-cylinder of the phonograph; but it is preferred to have the cutting and burnishing tools upon the phonograph itself, since the phonogram-blank can then be turned true to the cylinder of the machine, and can have the record removed from its surface, so that the phonogram-blank can be used over again repeatedly.

I do not claim in this application the process of preparing the wax surface of a phonogram-blank by burnishing the same, or first cutting and then burnishing the same, since I propose to file a separate application for patent upon such process. Nor do I claim herein a phonogram-blank having a recording-surface of wax or a wax-like material, or having such a surface

and a backing of tougher material, since this is covered by my application for Patent No. 734, Serial No. 252,964; neither do I claim herein such a phonogram blank when the base is of a molded material—such as plaster-of-paris—since this is covered by my application No. 740, Serial No. 256,188; neither do I claim herein a phonogram blank having a burnished wax or wax-like surface, since this will be made the subject of a separate application for patent.

What I claim is —

1. In a phonograph, the combination, with the phonogram blank carrier adapted to carry a wax-surfaced blank, of a burnishing-tool mounted upon the machine in position to act on the wax surface of the blank, substantially as set forth.

2. In a phonograph, the combination, with the phonogram blank carrier adapted to carry a wax-surfaced blank, of a heated burnishing-tool mounted upon the machine in position to act on the wax surface of the blank, substantially as set forth.

3. In a phonograph, the combination, with

the phonogram blank carrier adapted to carry a wax-surfaced blank, of a cutting-tool and a burnishing-tool mounted upon the machine in position to act in succession on the wax surface of the blank, substantially as set forth.

4. In a phonograph, the combination, with the revolving phonogram-cylinder and the traveling holding-arm, of the cutting-tool and the heated burnishing-tool moving with such traveling holding-arm, substantially as set forth.

5. In a phonograph, the combination, with the phonogram blank carrier adapted to carry a wax-surfaced blank, of a burnishing-tool mounted upon the machine in position to act on the wax surface, and electric-circuit connections for heating the tool by an electric current, substantially as set forth.

This specification signed and witnessed this 22d day of November 1887.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND

1136

(No Model.)

T. A. EDISON.

FEED AND RETURN MECHANISM FOR PHONOGRAPHS.

No. 382,416.

Patented May 8, 1888.

Fig. 1.

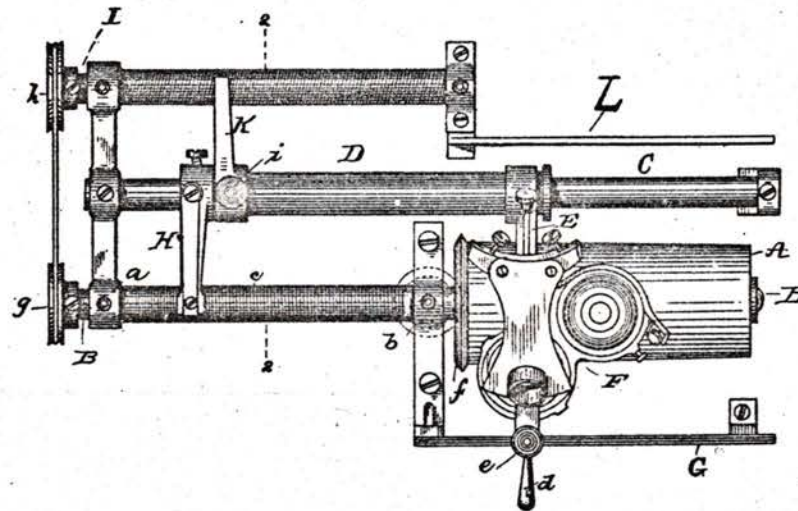


Fig. 2.

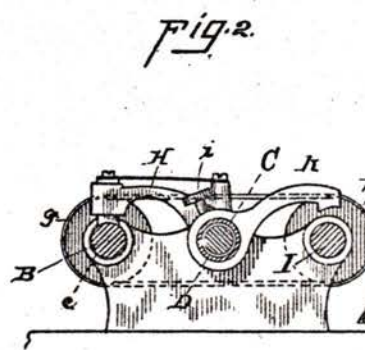


Fig. 3.

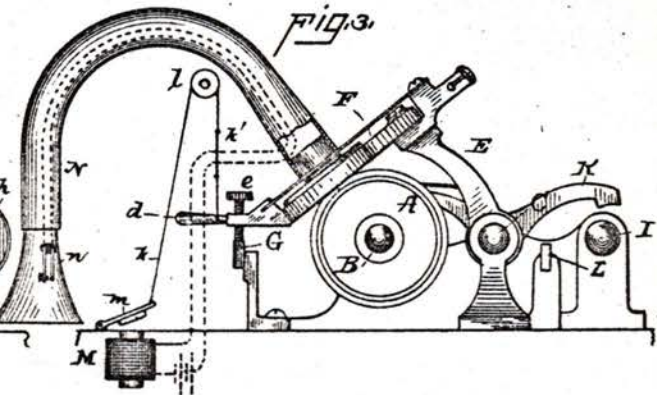


Fig. 4.



Witnesses.
E. A. Fowland,
T. M. Witherspoon

Inventor.
Thomas A. Edison

By his Attorneys *Dyer & Seely*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

FEED AND RETURN MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 382,416, dated May 8, 1888.

Application filed January 5, 1888. Serial No. 259,897. (No model.)

To all, whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 745,) of which the following is a specification.

The object I have in view is to produce a simple and efficient mechanism for setting back automatically on the depression of a key or treadle the reproducer of a phonograph for reproducing the whole or a portion of the record. This I desire to do without reversing the motion of the lead-screw and by a movement which lifts the reproducer from the surface of the phonogram. I accomplish this end by means of a screw-shaft revolving with the lead-screw and engaging when the reproducer is lifted from the phonogram-surface an arm on the guide-sleeve and moving such guide-sleeve back with a rapid motion.

To give rapidity to the movement, the retracting-screw is composed of a number of parallel threads which are as fine as the threads of the lead-screw, so that the arm will engage at any point, but, by reason of having a number of parallel threads, can be given a much greater pitch than the threads of the lead-screw. The rocking holding-arm carrying the reproducer is connected through a cord preferably having an elastic section with a lever, which may be a key or treadle, so that by striking the key or treadle the parts will be set back, or an electro-magnet can be used to lift the rocking holding-arm. The arm that engages with the retracting-screw is held by a set screw and can be set up out of action, or can be adjusted and held so as to engage the retracting-screw the moment the guide arm is released from the lead-screw.

In the accompanying drawings, forming a part hereof, Figure 1 is a top view of parts of a phonograph, illustrating my invention; Fig. 2, a cross section through the leading and retracting screws on the line 2 2, looking at the engaging arms; Fig. 3, an elevation from the outer end of the phonogram-cylinder, and Fig. 4 a separate enlarged view of a portion of the retracting screw.

A is the phonogram-cylinder, mounted on a shaft, B, held by bearings *a b*. Between these

bearings the shaft is cut with a fine screw-thread, forming the lead-screw *c*. In rear of the cylinder A and shaft B is the guide-rod C, upon which is mounted the guide-sleeve D. This guide-sleeve D slides on the guide-rod C, as will be understood. At one end of the sleeve D the rocking holding-arm E rises there from, carrying the swinging spectacles F, in the eyes of which are the recorder and reproducer. The spectacles have fingers *d* and set-screws *e*, which bear upon the guide-rest G. The guide-sleeve D has at its other end a guide-arm, H, with a screw-threaded end, which engages the lead-screw *c*. The cylinder A and shaft B being revolved from a motor by means of a soft bevel-wheel bearing on the bevel-flange *f* of the cylinder, the guide-sleeve D and the rocking holding-arm E, with the recorder and reproducer, are advanced from the left to the right, as seen in Fig. 1.

In rear of the guide-rod C, and parallel therewith and with the cylinder-shaft B, is a shaft, I, mounted in suitable bearings on the frame and revolved by a small round belt passing over wheels *g h* on the ends of this shaft and the cylinder-shaft. The shaft I is a screw cut with three parallel threads, which are as fine as the single thread of the screw *c*, but have a greater pitch. An arm, K, projects rearwardly from the guide-sleeve D and has a corresponding screw cut on its end to engage with the screw-shaft I. The arm K is secured to the sleeve D by a set-screw, *i*, so that it can be turned upon such sleeve and held at any point of adjustment. This permits the arm K to be thrown up out of the way and held by the set-screw, so that the rocking holding-arm E can be thrown over onto the back rest, L, without engaging the arm K with the screw-shaft I, or the arm K can be fixed at such a point that it will engage the screw-shaft I as soon as the guide-arm H is released from the lead-screw *c*. The arm K will engage the multiple thread of the shaft I at any point that the guide-arm H is released from the single thread of the screw *c*, because the threads are of equal fineness; but the screw-shaft I will retract the parts with much greater speed than the screw *c* feeds them forward by reason of its greater pitch, permitted by the use of a number of threads.

For lifting the reproducer from the phonogram and causing the arm K to engage the screw-shaft I, I connect the finger *d* of the eye of the spectacles carrying the reproducer with a cord, *k*, passing up over a wheel, *l*, and down to a lever, *m*, which may be a hand-key or foot-treadle. This cord preferably has an elastic section, *k'*, which will yield to permit the retracting movement of the reproducer.

10 An electro-magnet, M, acting on an armature on the lever *m* and controlled by a circuit-controller, *n*, on the listening-tube N, may be used for lifting the rocking holding-arm to set it back.

15 What I claim is—

1. In a phonograph, the combination, with the rocking holding-arm carrying the reproducer, of a revolving screw-shaft and an arm connected with the rocking holding-arm and engaging this screw shaft when the rocking holding-arm is rocked to lift the reproducer from the phonogram, whereby the reproducer is retracted or set back, substantially as set forth.

25 2. In a phonograph, the combination, with the phonogram-cylinder, the lead-screw, and holding and guide arms, of a revolving screw-shaft having a screw of greater pitch than the lead-screw, and an arm engaging this screw-shaft when the guide-arm is raised from the lead-screw, substantially as set forth.

30 3. In a phonograph, the combination, with the phonogram-cylinder, the lead-screw, and holding and guide arms, of a revolving screw-shaft having a screw composed of a number of threads of greater pitch than the lead-screw, and an arm engaging this screw-shaft when the guide-arm is raised from the lead-screw, substantially as set forth.

40 4. In a phonograph, the combination, with the phonogram-cylinder, the lead-screw, the guide-sleeve, and the holding and guide arms,

of the retracting-screw shaft and the arm engaging therewith fixed adjustably upon the guide-sleeve, substantially as set forth.

5. In a phonograph, the combination, with the phonogram-cylinder, the lead-screw, the guide sleeve, and the holding and guide arms, of the retracting-screw shaft driven by a belt from the cylinder-shaft, and the arm engaging therewith fixed adjustably upon the guide-sleeve, substantially as set forth.

6. In a phonograph, the combination, with the rocking holding-arm, the lead and retracting screws, and the arms engaging such screws alternately, of a lever connected by an elastic lifting-cord with such rocking holding-arm to rock and set back the holding-arm, substantially as set forth.

7. In a phonograph, the combination, with the rocking holding-arm carrying the reproducer or recorder, of an electro-magnet and armature acting to lift such arm and disengage the reproducer or recorder from the phonogram-surface, substantially as set forth.

8. In a phonograph, the combination, with the rocking holding-arm carrying the reproducer or recorder and the lead-screw, of an electro-magnet and armature acting to lift such arm, disengaging it from the phonogram and from the lead-screw, substantially as set forth.

9. In a phonograph, the combination, with the rocking holding-arm carrying the reproducer or recorder and the lead and retracting screws, of an electro-magnet and armature acting to lift such arm, disengaging it from the lead-screw and connecting it with the retracting-screw, substantially as set forth.

This specification signed and witnessed this 29th day of November, 1887.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

1139

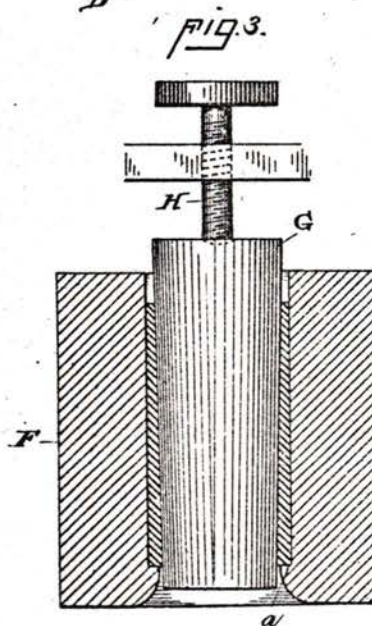
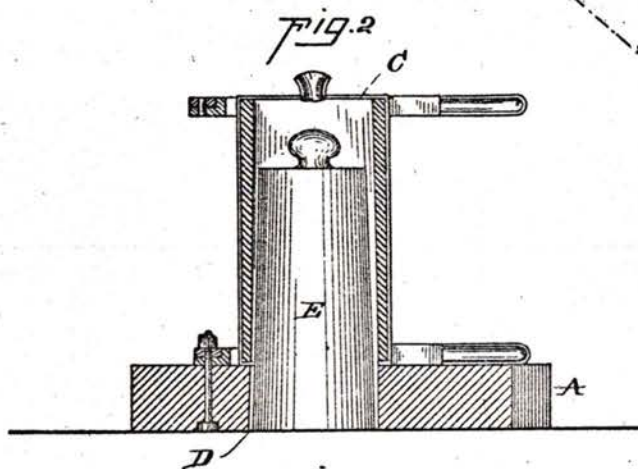
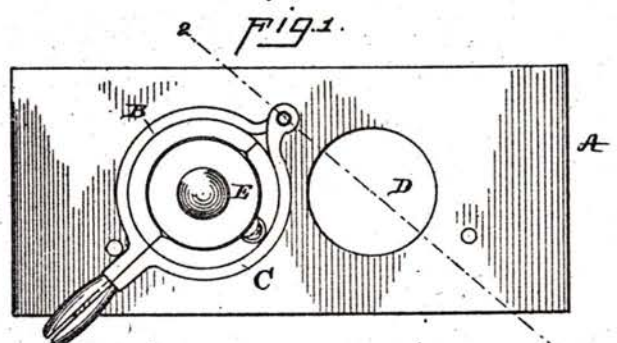
(No Model.)

T. A. EDISON.

PROCESS OF MAKING PHONOGRAM BLANKS.

No. 382,417.

Patented May 8, 1888.



Witnesses.
E. Howard
William R. Ryan

Inventor.
Thomas A. Edison
 By *Attorneys* *John S. May*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF MAKING PHONOGRAM-BLANKS.

SPECIFICATION forming part of Letters Patent No. 382,417, dated May 8, 1888.

Application filed February 4, 1888. Serial No. 263,047. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Processes of Making Phonogram-Blanks, (Case No. 758,) of which the following is a specification.

The object I have in view is to produce a method or process of making wax phonogram-blanks which will result in a more accurate blank and one having a better surface for receiving the phonograph-record.

The blank which I prefer to use is a hollow tapering cylinder; but the process is applicable to blanks of other forms. It is hereinafter described as applied to the tapering cylindrical blanks.

I first mold the wax blank by pouring melted wax into a mold having the necessary shape for producing a hollow tapering cylinder. The molded cylinder is then pressed in a die of highly-polished metal, (preferably speculum metal,) and it is thereby given the exact shape and size desired, both externally and internally, and its surfaces are given a high polish, so that upon the removal of a blank from this die it will be ready for use without any cutting. The blank is removed from the mold and placed in the die while it is still partially plastic—say after its temperature has fallen to about 100° Fahrenheit.

In the accompanying drawings, forming a part hereof, Figure 1 is a top view of the mold. Fig. 2 is a cross-section of the mold on the line 2 2, when the mold is swung to the right; and Fig. 3 is a view, partially in section and partially in elevation, showing the pressing of the blank in the finishing-die.

The mold for molding the cylinder is shown, for convenience, as of the particular construction described in a prior application for patent, (Serial No. 260,923,) although it may be of any other suitable construction. It is composed of a base, A, upon which the mold is pivoted, such mold being composed of two parts, B C, adapted to be separated for opening the mold, and also adapted to be swung bodily upon the base, so as to bring the mold over the opening D in the base or over the solid portion of the base:

E is the tapering core of the mold. The mold is swung to the left over the solid part of the base, and the core being placed in it and the mold closed, hot wax is poured into the mold, forming a cylinder around the core E. When the wax is partially cool, sufficiently so to retain its shape, the mold is swung to the right over the opening D and the core E is pushed down into the opening D, as shown in Fig. 2, thus permitting the wax to contract without breaking. After the cylindrical blank has cooled down to a temperature where it is still slightly plastic—say 100° Fahrenheit—it is removed from the mold and is placed in the die F. This die may be a divided die or one that is solid. It has a cylindrical opening with a shoulder, a, at its lower end. A tapering plunger, G, pressed forward by a screw, H, is forced into the bore of the phonogram-blank, pressing the blank against the walls of the surrounding die, and giving it the exact shape and size both externally and internally that it is desired the blank should have. The die and its plunger are made of highly-polished metal. Speculum metal is preferably used for this purpose. The plunger is then removed from the blank and the blank removed from the die, when it will be ready for use on a phonograph. The blank formed in this way is accurate in its size and has a highly-polished recording-surface, which improves the articulation of the phonograph, and also has its bore accurately tapered, so as to fit the cylindrical phonogram-carrier of the phonograph.

What I claim is—

1. The process of making wax phonogram-blanks, consisting in first molding the blank from melted wax and then pressing the blank in a polished die, substantially as set forth.
2. The process of making cylindrical wax phonogram-blanks, consisting in first molding the cylindrical blank from melted wax and then pressing the blank both externally and internally in a polished die, substantially as set forth.

This specification signed and witnessed this 30th day of January, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

1141

(No Model.)

T. A. EDISON.
PHONOGRAM BLANK.

No. 382,418.

Patented May 8, 1888.

Fig. 1.

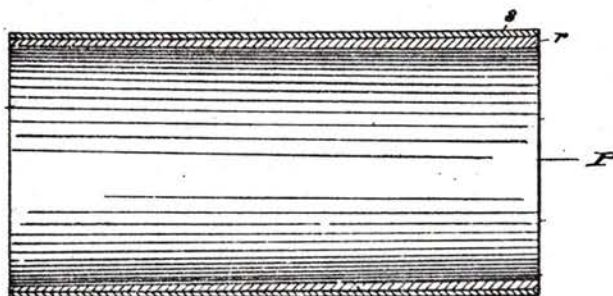
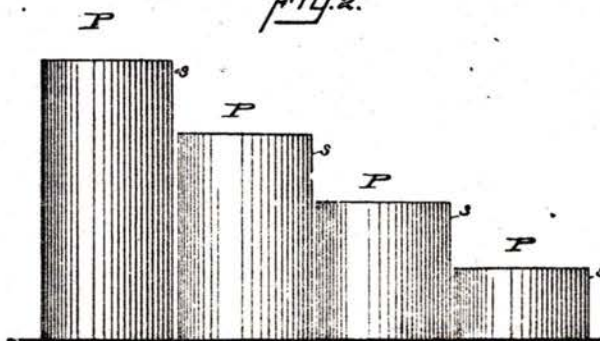


Fig. 2.



Witnesses
E. C. Fowland
William J. Fowland

Inventor.
Thomas A. Edison.
By his Attorneys Dyer & Wheeler.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 382,418, dated May 8, 1888.

Original application filed November 26, 1887 Serial No. 256,189. Divided and this application filed March 2, 1888. Serial No. 265,889, (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonogram-Blanks and Phonograms, (Case No. 762, division of Case No. 741,) of which the following is a specification.

The object I have in view is to produce a cylindrical phonogram-blank or phonogram which can be readily placed upon the phonogram-cylinder of a phonograph, and will center itself, and will also be adapted to retain its place upon the phonogram-cylinder by friction alone. This I accomplish by providing the cylindrical phonogram blank or phonogram with a tapering bore adapted to fit over a similarly-tapered phonogram-cylinder. The phonogram-blank or phonogram is provided with a cylindrical recording surface. Blanks or phonograms of the full length of the tapering phonogram-cylinder of the phonograph can be used as well as those of shorter length, the tapering bore centering the blank or phonogram, and adapting it to be pushed onto the phonogram-cylinder until it binds thereon with sufficient friction to hold it in place.

In the accompanying drawings, forming a part hereof, Figure 1 is a sectional view of a phonogram-blank or phonogram, showing by dotted lines its division into sections; and Fig. 2 an elevation, showing four different sizes of the phonogram-blank or phonogram.

P represents phonogram-blanks or phonograms. They have a cylindrical recording surface, *s*, made of wax, or a wax-like substance, which may be mounted upon a backing, *r*, which is also a cylinder, but has a tapering bore adapted to fit upon a similarly-tapered phonogram-cylinder of a phonograph.

I propose to make these phonogram-blanks the entire length of the phonogram-cylinder, and also to divide such full-length phonogram-blanks into parts, so that sectional phonogram-blanks will be produced, which will be, for illustration, one-fourth, one-half, and three-fourths the length of the full-size phonogram blanks. All of these sectional phonogram blanks, as well as the full-sized phonogram-blank, will have the tapering bore, so that they can be pushed upon the tapering phonogram-cylinder until they bind, and the instrument can then be adjusted to them for recording and reproducing.

I do not claim herein a phonogram-blank having a recording surface of wax, or a wax-like material, nor such a surface mounted upon backing of tougher material, such matters being covered by my application for patent, (Case No. 734, Serial No. 252,964,) filed October 21, 1887.

What I claim is—

1. A phonogram-blank or phonogram having a bore tapered throughout its length, substantially as set forth.

2. A phonogram blank or phonogram having a cylindrical recording-surface and a tapering bore, substantially as set forth.

3. A phonogram-blank or phonogram having a cylindrical recording-surface of wax or wax-like material and provided with a tapering bore, substantially as set forth.

This specification signed and witnessed this 20th day of February, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND,

1143

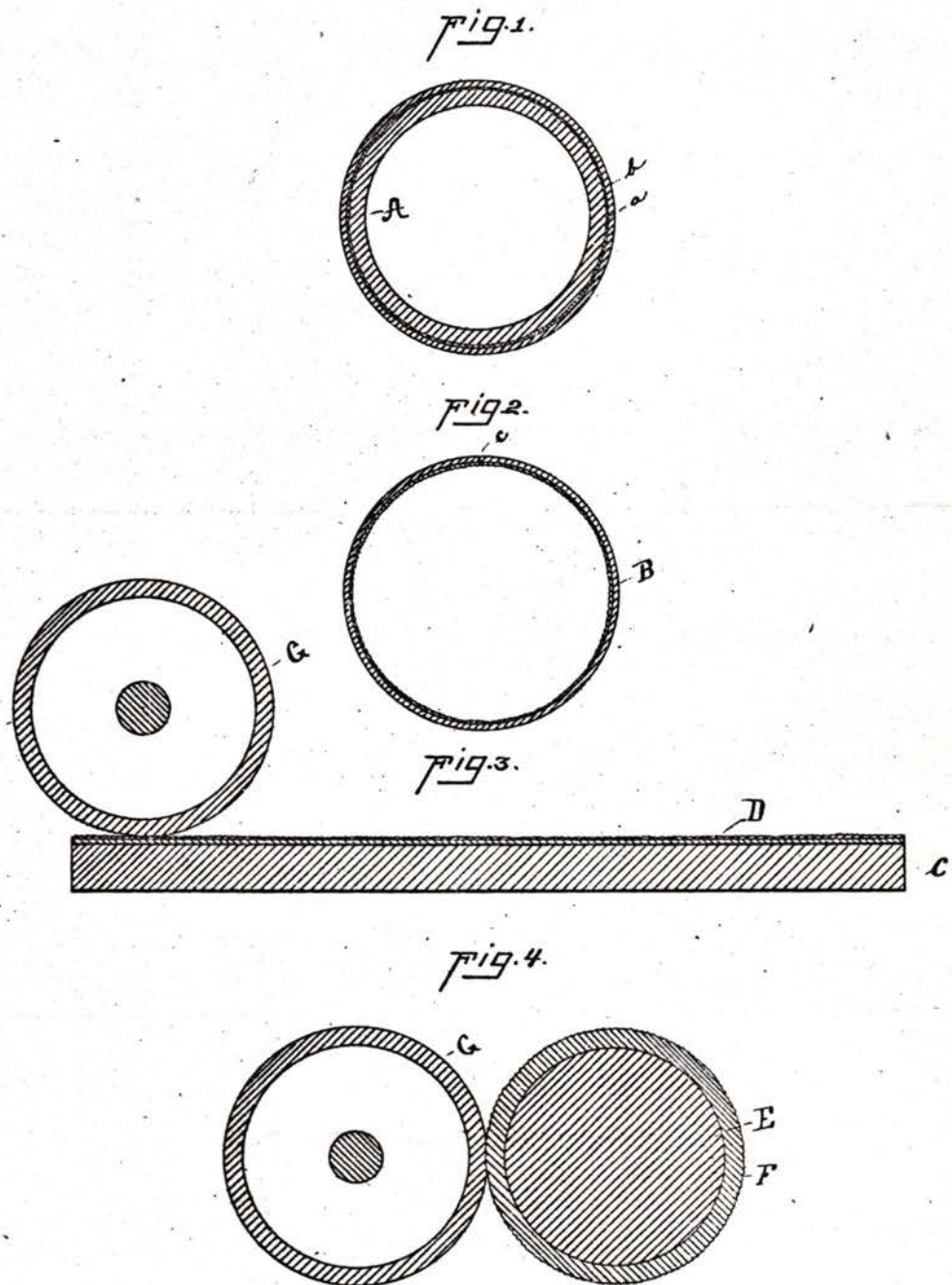
(No Model.)

T. A. EDISON

PROCESS OF DUPLICATING PHONOGRAMS.

No. 382,419.

Patented May 8, 1888.



Witnesses
E. H. Howard
William Ager

Inventor,
Thomas A. Edison.
By his Attorneys *John S. [Signature]*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 382,419, dated May 8, 1888.

Application filed March 8, 1888. Serial No. 266,596. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Processes for Duplicating Phonograms, (Case No. 765,) of which the following is a specification.

The object of my invention is to produce a simple and efficient process for duplicating phonographic records. In applications already filed by me I describe a process for duplicating phonograms, wherein a metallic matrix is formed by depositing metals over the surface of cylindrical wax phonograms and then dissolving out the wax, leaving a hollow matrix or mold with the record in relief upon its inner surface. By my present invention I propose to apply the process of knurling to the duplication of phonograms as distinguished from molding. In my English Patent No. 1,644 of 1878 I proposed to construct a knurl by depositing metal over the record; but it is obvious that if this deposit were made of any thickness at all the record would be largely obliterated.

By my present invention I deposit metals over the record of the recording-surface of a cylindrical wax phonogram, and after melting out the original wax I divide the remaining cylinder by splitting it longitudinally with a thin saw on one side. I then open the cylinder out flat or further bend it into the form of a cylinder, with the record upon its exterior. To give the necessary strength I provide a suitable backing. The result is a flat or cylindrical knurling-surface having the record in relief, so that by rolling a wax phonogram-blank upon it the original record will be reproduced.

For making the first deposit upon the original wax phonogram I prefer to employ silver, which is deposited upon the wax phonogram by the vacuum process or by electroplating. A thin coating is produced in this way, which is backed up by a coating of lead or tin, which is also quite thin. For example, it may be one-sixteenth of an inch in thickness. The silver gives an inoxidizable surface, which is cheaper than gold or platinum. After the wax is dissolved out and this cylinder split on one side it will be found to have sufficient flexi-

bility by reason of the materials employed and the thinness of the cylinder to permit of its being bent without injury to the record into the form of a flat sheet or a reversed cylinder. If bent around a cylinder it will be secured to the same by cement, and if bent into a flat sheet it will likewise be secured to a suitable bed-plate, the cylinder or bed-plate giving the necessary strength to the record. The duplicate phonogram-blanks upon which I impress the original record by means of the knurl are preferably of a wax composition, which is too hard to be practically indented directly in the phonograph, although softer compositions may be employed, or materials other than wax.

In the accompanying drawings, forming a part hereof, Figure 1 is a sectional view showing the original phonogram with the deposit thereon; Fig. 2, a similar view with the original phonogram melted out or removed from the encircling metal deposit. Fig. 3 is a sectional view illustrating the flat knurling-surface, and Fig. 4 a similar view illustrating the cylindrical knurling-surface.

A is the original wax phonogram, upon the surface of which is the phonographic record, upon which is formed a thin deposit of silver, a, and over this a thicker deposit of lead or tin, b, the entire metallic deposit being, for illustration, one-sixteenth of an inch thick. After this deposit is made the wax cylinder A is melted out of the metal coating, leaving the metallic cylinder B (shown in Fig. 2) with the record in relief upon its inner surface. This cylinder B is split longitudinally on one side at the point c, and it is then bent out flat and mounted upon a suitable base plate, C, to which it is secured by cement, forming a flat knurling-surface, D; or the cylinder B may be bent reversely over a solid cylinder, E, and secured thereto by cement, forming a cylindrical knurl, F. (Shown in Fig. 4.) The wax duplicate phonogram-blank G is impressed with the original record by rolling it against the flat or the cylindrical knurling surface, as will be readily understood.

I do not claim herein the method of duplicating phonograms by depositing metals upon a cylindrical wax phonogram and then melting or dissolving out the original wax phonogram, leaving a matrix with the record in relief upon its inner surface; neither do I claim

herein the use of a vacuum deposit for producing a coating upon the wax phonogram; neither do I claim herein a duplicate phonogram constructed of a hard material not capable of being satisfactorily indented by a phonograph, since these features are covered in my applications Nos. 743, 744, and 751, already filed by me. Such applications have respectively the Serial Nos. 259,895, 259,896, and 262,423.

What I claim as my invention is—

1. The process of duplicating phonograms, consisting in forming a knurl having the original record in relief by depositing metal upon the original record, removing the original phonogram and opening the metallic coating, and then impressing duplicate phonogram-blanks with the original record by means of such knurl, substantially as set forth.

2. The process of duplicating phonograms, consisting in depositing a flexible metallic coating upon an original cylindrical phonogram, removing the original phonogram from the inclosing-coating, splitting the inclosing-coating longitudinally, bending the same to form a knurl, and then impressing the duplicate phonogram-blanks with the original record by means of this knurl, substantially as set forth.

This specification signed and witnessed this 3d day of March, 1888.

THOS. A. EDISON.

Witnesses:

WM. PELZER,
E. C. ROWLAND.

1146

(No Model.)

T. A. EDISON.
PHONOGRAM BLANK.

No. 382,462.

Patented May 8, 1888.

Fig. 1.

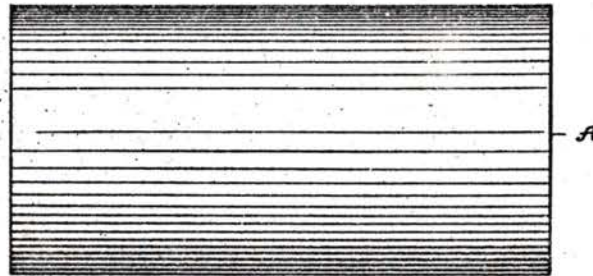


Fig. 2.

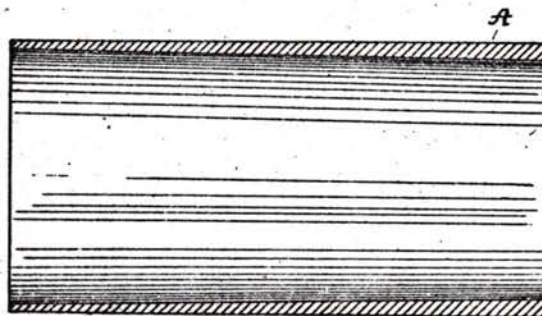
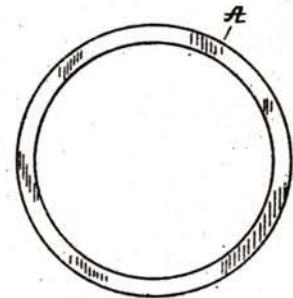


Fig. 3.



Witnesses:
E. F. Fowland,
William C. Fyfe.

Thomas A. Edison. Inventor.
By his Attorneys *J. S. & L. S.*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 382,462, dated May 8, 1888.

Application filed January 8, 1888. Serial No. 259,898. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonogram-Blanks and Phonograms, (Case No. 747,) of which the following is a specification.

I have found in practice that the most available surface for phonogram-blanks and phonograms is one composed of wax, gum, or other plastic hydrocarbon. Such compounds, however, I find contract and expand under variations of temperature to a much greater extent than paper, wood, metals, and other similar harder substances. While under ordinary conditions the wax or wax-like surface may not be injured by this difference in the coefficient of expansion, yet when subjected to extreme cold the contraction of the wax is so much greater than the harder backing that the wax will crack and destroy the continuity of the surface. For instance, a phonogram-blank or phonogram may be subjected to a temperature of nearly 100° Fahrenheit at one time and at another time the temperature may fall below zero. If the waxy substance is sufficiently hard at the high temperature to hold its shape under the pressure of one on the other in a packing-box, it will at the low temperature harden and contract so greatly in excess of the backing of harder material that the wax will crack and render the surface useless.

The object I have in view is to produce a phonogram-blank or phonogram which will have the wax or wax-like surface and will not be subject to the objection that has been stated. This I accomplish by constructing the phonogram-blank or phonogram wholly of the wax or wax-like material. I prefer to mold the entire phonogram-blank of the one wax-like compound; but I may construct the base or

backing of the surface of a somewhat different mixture of wax or wax-like materials than that of which the surface is made, so long as the whole has substantially the same coefficient of expansion.

My phonogram-blank I prefer to mold as a hollow cylinder with a tapering bore for slipping over the tapering phonogram-cylinder of my phonograph.

In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of the phonogram-blank; Fig. 2, a longitudinal section thereof, and Fig. 3 an end view.

A is the cylindrical phonogram-blank, molded of the plastic wax or wax-like material, as described, and having a tapering bore.

The invention is also applicable to duplicate phonograms having the phonographic record thereon.

What I claim is—

1. A phonogram blank or phonogram constructed wholly of wax or wax-like materials and having the same coefficient of expansion throughout its mass, substantially as set forth.

2. A phonogram-blank or phonogram constructed as a hollow cylinder wholly of wax or wax-like materials and having the same coefficient of expansion throughout its mass, substantially as set forth.

3. A phonogram-blank or phonogram constructed as a hollow cylinder, with a tapering bore wholly of wax or wax-like materials, and having the same coefficient of expansion throughout its mass, substantially as set forth.

This specification signed and witnessed this 5th day of December, 1887.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

(No Model.)

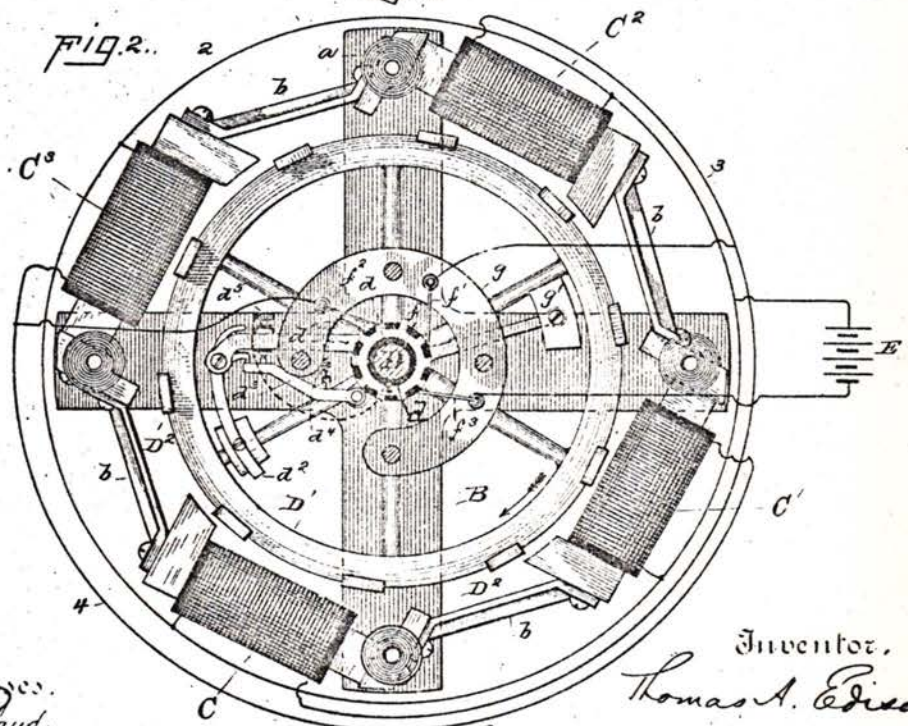
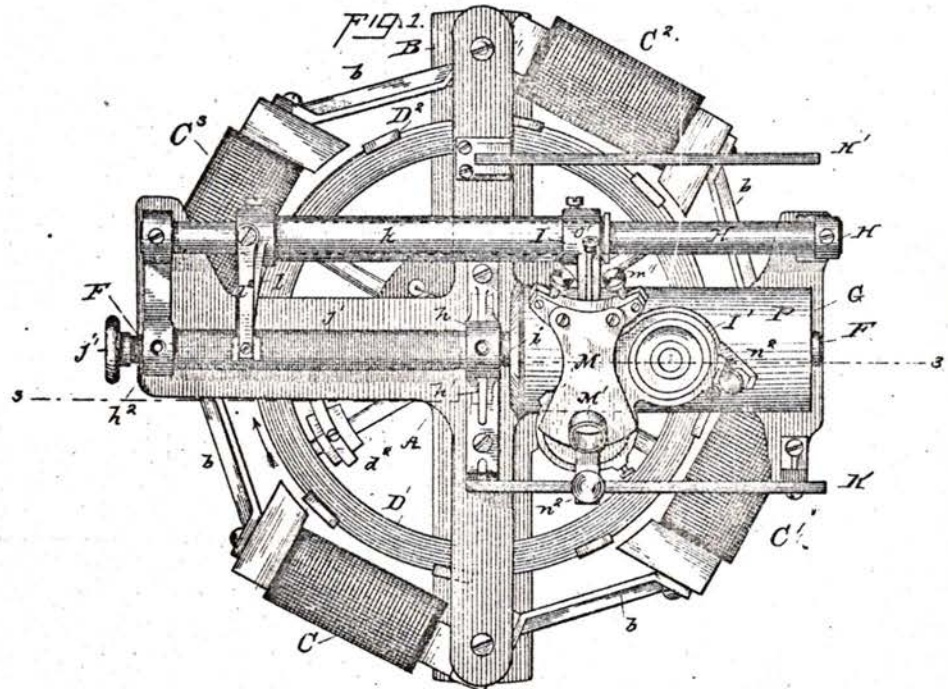
3 Sheets—Sheet 1.

T. A. EDISON.

PHONOGRAPH.

No. 386,974.

Patented July 31, 1888.



Witnesses.
E. Howard
William A. Rye

Inventor,
Thomas A. Edison
 By his Attorneys
Dyer & Leach

(No Model.)

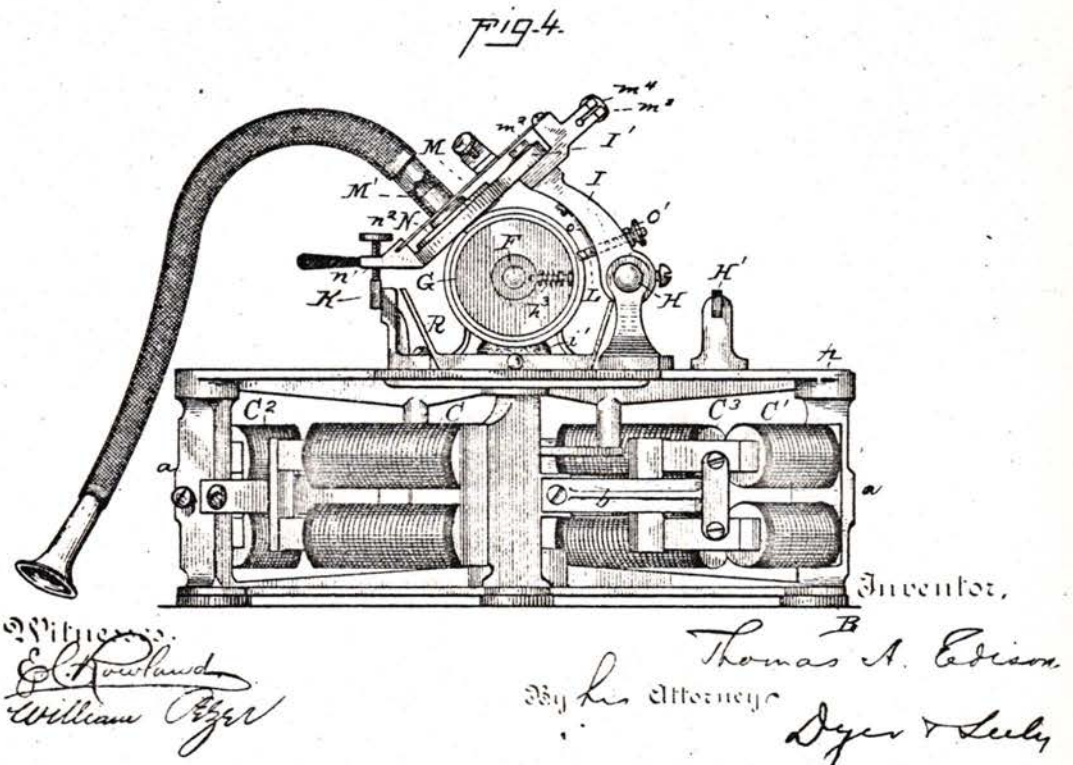
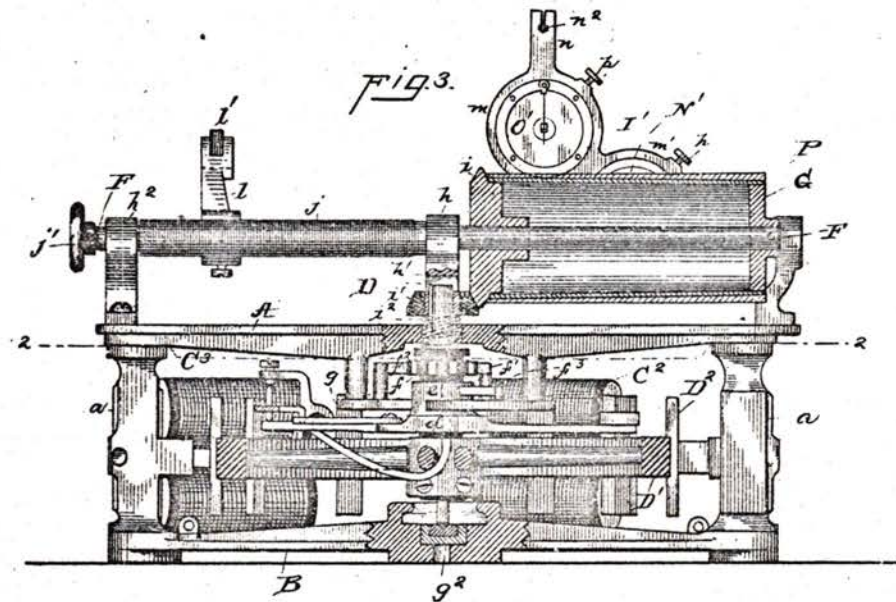
3 Sheets—Sheet 2.

T. A. EDISON.

PHONOGRAPH.

No. 386,974.

Patented July 31, 1888.



UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 386,974, dated July 31, 1888.

Application filed November 26, 1887. Serial No. 256,189. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
 5 new and useful Improvement in Phonographs, (Case No. 741,) of which the following is a specification.

The object I have in view is, generally, to so improve the phonograph that it will be well
 10 adapted for use by the public and will be a convenient and efficient machine for various uses.

In the accompanying drawings, forming a part hereof, Figure 1 is a top view of the machine; Fig. 2, a horizontal section on the line
 15 2 2 in Fig. 3, with a diagram of the motor connections; Fig. 3, a vertical section on the line 3 3 in Fig. 1, with the swinging holder and guide-arm thrown back; Fig. 4, an elevation
 20 of the machine looking at the end of the phonogram-cylinder; Fig. 5, top view of the swinging holder carrying the recorder and reproducer; Fig. 6, a side elevation of the guide-arm; Fig. 7, a sectional view, on an enlarged
 25 scale, showing the engagement of the spring guide-block with the lead-screw; Figs. 8 and 9, a bottom view and central section, respectively, of the recorder; Figs. 10 and 11, a bottom view and central section, respectively, of
 30 the reproducer; Fig. 12, an elevation of the guide-rest; Fig. 13, a sectional view of a phonogram blank showing by dotted lines its division into sections, and Fig. 14 an elevation showing the four different sizes of the phonogram-blank.

Like letters denote corresponding parts in all the figures.

The frame of the machine is constructed, for convenience, of a top and a bottom plate,
 40 A B, each constructed as a spider composed of four arms, the ends of the arms of the two frames being joined by vertical posts *a*. To these posts are connected the yokes of four magnets, C C' C' C', each projecting from the
 45 post to which it is attached toward the adjoining post, to which its pole-pieces are connected by braces *b* of brass or other non-magnetic metal. The poles of the four magnets project inwardly, as shown, and are cut with
 50 concave faces, the poles of all four magnets being in the line of a circle. Within this circle and mounted upon a vertical shaft, D,

is a fly-wheel, D', constructed of brass and having a heavy rim so as to increase its weight. Upon the periphery of the rim of the fly-wheel
 55 are secured a number of armatures, D², of iron, which are placed vertically, equal distances apart, and travel in their movement close to the pole-pieces of the magnets C, C', C', and C'. Upon the shaft D, above the wheel D', is mounted
 60 a sleeve, *d*, of insulating material, upon which is secured a metal collar, *e*, and above this collar a commutator, *f*, the commutator being composed of a ring of metal having its
 65 surface broken by blocks of insulating material, so that it presents alternate spaces of insulation and metal in a manner well understood. From the collar *e* projects an arm, *d'*, in
 70 a radial direction, and upon the end of this arm is pivoted a swinging weight-arm, *d''*, which, by its outward movement, moves a lever, *d'''*, which is held against its movement by an adjustable
 75 spring, *d''''*. The lever *d'''* bears normally upon the insulated contact-screw *d³*, which is connected by a wire with the base of the commutator *f*.

The magnets C C' C' C' have one end of their windings connected together by a wire,
 2. The other end of the windings of the two opposite magnets C and C' are connected together
 80 by a wire, 3, while the other ends of the windings of the opposite magnets C' and C are connected together by a wire, 4. The wires 3 and 4 are connected with two springs, *f'* and *f''*, which bear upon the face of the commutator
 85 *f*. A spring, *f³*, bears directly upon the collar *e*. These three springs are supported by a circular piece of insulation, *g*, which is supported above the wheel D' and below the top plate by means of posts extending down
 90 from the top plate.

One pole of the battery E which drives the motor is connected with the wire 2, which joins one end of the windings of all the magnets,
 95 while the other pole of the battery is connected with the spring *f³*, bearing upon the collar *e*. The parts are arranged so that the wheel D' will be turned by the magnets always in the direction shown by the arrow in the drawings.

The magnets C and C' first receive the current and attract two armatures upon the wheel, and then the magnets C' and C receive the current and attract two armatures upon

the wheel, the current being transferred from one pair of magnets to another in succession, so that the wheel is given a continuous rotary movement. An excess of battery-power is preferably used, and the speed of the wheel controlled by the governor, formed by the spring-retracted arms d' and d'' . This governor opens the circuit when the speed exceeds the normal, so that within limits of variation which are so small as to be practically of no effect in the operation of the machine the speed will be kept uniform. By the adjustment of the spring d' the governor can be made to work at any desired point. By the use of an electro-magnetic motor of this description—namely, one composed of a heavy fly-wheel carrying armatures on its periphery, which are attracted by magnets arranged in a circle around the fly-wheel—a slow and uniform motion can be obtained, which is a matter of the highest importance in the operation of the phonograph, and tends to simplify the construction, since the complication introduced by the employment of a number of speed-reducing wheels is avoided. Projecting from the collar c on the opposite side to the governor is an arm, g' , carrying a weight at its end for counterbalancing the weight of the governor, so that the wheel may be a balanced one. The shaft D is stepped on a jewel, g'' , at the center of the bottom plate, A, giving freedom of movement to the wheel and reducing the noise of friction to the minimum, so as to not affect materially the operation of the phonograph.

Upon the top plate, A, is journaled the horizontal shaft F, this shaft being carried by a journal-box, h , in the top of an arched standard, h' , at the center of the top plate, and at one end by a journal-box, h'' , at the end of one of the arms of the top plate. Between the bearings h and h'' the shaft F is larger than it is outside of such bearings, so that it bears against the inner faces of the bearings by shoulders which prevent any longitudinal movement of the shaft. The shaft F projects beyond the bearing h to the opposite side of the machine from the bearing h'' , but is not supported at its end, it being free to receive the phonogram-cylinder G, which is slipped upon this shaft, preferably removably, and held by a spring pin, h^3 , taking into a hole in the end of the shaft. This phonogram-cylinder is made hollow, of brass or other suitable metal, its heads bearing upon the shaft, so as to center the cylinder properly. The cylinder is made slightly tapering, for a purpose which will be presently explained, its inner end—that next to the bearing h —being somewhat larger than its outer end. The inner end of the phonogram-cylinder is constructed as a beveled friction-wheel, i , upon which bears a beveled pinion, i' , of some suitable soft material. This pinion i' is mounted upon the upper end of the shaft D, which projects through the top plate into the space between the legs of the arched standard h' . The pinion i' may be provided

with an operative face, of leather or other similar material, mounted upon a metal hub. This metal hub is preferably constructed to slide vertically upon the shaft D, it being prevented from turning thereon by a suitable key, and beneath the pinion is a spiral spring, i'' , which forces the pinion upwardly and keeps it solidly against the beveled wheel on the inner end of the phonogram cylinder, so that the wear of the surfaces is taken up and the pinion is kept in firm contact. By the use of this beveled friction-gearing, of which the soft-surfaced pinion is a part, I am enabled to change the motion from the vertical shaft of the motor to the horizontal shaft of the phonogram-cylinder without the production of noise, which would be detrimental to the operation of the instrument.

The horizontal arrangement of the motor permits a large fly-wheel to be used, while the compactness of the instrument is maintained. Between the bearings h and h'' the shaft F is cut with an exceedingly fine screw-thread, j , of the peculiar construction which will be explained farther on, while outside of the bearing h'' the shaft is provided with a hand-wheel, j' , by which it can be held when it is desired to remove the phonogram-cylinder from the shaft or remove the phonogram blank or phonogram from the phonogram cylinder without taking the latter off of the shaft.

Parallel with the shaft F, and located in the rear of the same, is a guide rod, H, mounted in suitable supports at its ends and extending entirely across the machine. Upon this guide-rod is an accurately-fitting tube, k , which is of such length that it can be moved upon the rod between the supports at the end of the rod a distance equal to the length of the phonogram-cylinder. Upon the end of this tube next to the phonogram-cylinder is secured the holding arm, which carries the recorder and reproducer, while at the opposite end of this tube is the guide-arm, which engages with the lead-screw j . The guide-arm is a rigid arm, l , having a hub which slips on the tube k , and is secured thereto by a set-screw. This guide-arm projects toward the shaft F, terminating at its free end above the screw-thread j . The end of the arm l is slotted, so as to form two guide-checks, between which plays a vertically-sliding block, l' . This block l' bears upon the screw thread j , and is cut with a section of the corresponding thread. A spring, l'' , extends along the top of the arm l , and is secured to the block l' , forcing such block downwardly upon the screw-thread, so that a rocking movement of the tube k can be made within certain limits without disengaging the block l' from the screw-thread j . The screw-thread j and the thread upon the block l' are cut as fine as it is possible to make a screw-thread having the desired wearing capacity. I make this screw-thread, preferably, with about one hundred threads to the inch, and in order to make such a fine thread do the work required of it without danger of the guide arm

being forced back, I construct these threads as a ratchet, as shown in Fig. 7, the engaging sides of the threads being straight and the other sides beveled, so that the danger of slipping backward is entirely obviated. Upon the other end of the tube k is secured the arm l by means of a set-screw, such arm projecting forward over the center of the phonogram-cylinder. Upon the upper end of this arm l is pivoted the holding-frame l' , placed nearly at right angles to the arm l , and made, similar to the frame of spectacles, with two eyes, m m' . The pivoting-screw m^2 for this frame passes through the frame at one side and centrally between the eyes m m' , the nut for securing the frame bearing upon the spring-washer beneath it, so that the frame will hold itself at either limit of its throw and will not be jarred from position.

The arm l has two horns, m^3 , through which the set-screws m^4 pass for limiting the movement of the frame l' and for adjusting the point at which the frame will be stopped when swung in either direction, so as to bring its holding eyes in the correct relation to the phonogram-cylinder. These holding-eyes carry the recorder and reproducer, the construction of which will be presently explained, and the object of the swinging frame is to permit either the recorder or reproducer to be brought into operative relation with the phonogram-cylinder.

The screws m^4 , bearing upon the swinging frame l' , form a means for adjusting such frame and the recorder or reproducer carried by it laterally with respect to the spiral line of record upon the surface of the phonogram-blank. This adjustment is a matter of especial importance so far as the reproducer is concerned. The recorder produces the record, and hence makes its own track; but the reproducer must follow that track. It has been proposed to mount the reproducing-point in such a flexible manner that it will follow the track made by the recorder without adjustment; but I have found that the lateral adjustment of the reproducer enables me to bring its point readily into the track of the record, and to give it the proper relation to the record for producing the maximum effects. The adjustment is made while the operator has his ear to the listening-tube, the character of the reproduced sounds determining when the proper adjustment is reached.

The eyes m m' have fingers n n' , which project forward and have passing through them adjusting screws n^2 , which rest as each eye is brought into position for operation upon a guide-rest, K , which extends parallel to the shaft F in front of the phonogram-cylinder and supports the holding-frame at the required elevation to bring the recorder or reproducer into accurate adjustment. The fingers n n' have small handles attached to them, as shown in Fig. 4, by which the swinging holding frame can be more conveniently manipulated. Back of the guide-rod H there is another rest, H' ,

to receive the arm l when it is thrown back. This rest is preferably more or less springy in its character, so as not to jar the parts injuriously when the arm is thrown back upon it. Passing through the arm l near the tube k is the shank of a cutting-tool, L , which is thrown forward by a spring, o , on the inner side of the arm and is retracted by a thumb-nut, o' , on the screw-threaded end of the shank outside of the arm. This cutter L is designed to turn off the surface of the phonogram or phonogram-blank, so as to make it true for recording, or to turn off one record and leave the surface ready for another record. This enables one phonogram-blank to be used over and over again for recording and reproducing, the recorder and reproducer being brought into operative relation with the clear surface, as the diameter of the phonogram-blank is decreased, by the adjustment of the screws n^2 , the yielding guide-block L' permitting this to be done.

Upon the arm l , above the swinging holding-frame for the recorder and reproducer, is secured a carrying-plate, M , to which is connected a tube, M' . This tube serves as the mouth and ear piece of the instrument, or it may have mouth and ear pieces removably attached to it. The plate M is stationary, and the holding-eyes are swung under it alternately, so that one tube answers both for recording and reproducing, thus adding to the simplicity of the instrument.

The recorder N is a circular plate, which fits either eye, m or m' , of the carrying-frame, it being provided with a rib engaging with a groove in the eye, so that it will always have the same position in the eye. It is shown as held by the eye m' . A set-screw, p , is used for holding the plate in the eye. This plate N has an opening, p' , through it, which is brought into line with the tube M' when the eye m' is swung into position for the operation of the recorder. The back of the plate N is recessed to form a circular chamber, on a shoulder in which is placed the diaphragm N' , which is preferably made of celluloid or some other light material, and is placed in the recess at the back of the plate N , but is left free at its edges. The recording-point p^2 is secured to the center of the diaphragm by wax or in any other suitable way. This point is constructed of a thin plate of steel, which is cut or ground to a point on one edge and is beveled backwardly away from that edge, so as to give a support for the indenting-point and prevent vibration of that point in operation. This point passes through the end of the lever p^3 , and is secured therein by a set-screw, p^4 , the point being surrounded between the lever and the diaphragm by a small tube, p^5 , of rubber or other suitable material. The lever p^3 is rigid in its construction, and is mounted upon a cross-pin, p^6 , of considerable length, which is journaled at its ends at the sides of the plate N . The lever p^3 extends beyond the pivoting-pin p^6 and rests at its outer end against a block, q , which is faced with a piece

of pure india-rubber, q' . This block is set in a recess in the edge of the plate N, and is adjusted forward by a screw, q^1 . The adjustable block q and its elastic face q' form a yielding limiting-stop for the movement of the indenting-point. The other end of the lever p^3 extends beyond the indenting-point p^2 and receives inward pressure from a spring, q^2 , which is secured to the rim of the plate N, opposite to the block q , and presses the lever p^3 and the indenting-point inwardly; so as to give the center of the diaphragm a slight inward bend, producing an initial strain upon the diaphragm. Between the end of the spring q^2 and the lever p^3 a piece of india-rubber, q^3 , is placed. The lever p^3 , being rigid in its construction and in its support by the long bearing, prevents any vibration of the indenting-point, while the adjustable limit-stop formed by the block q and rubber q' limit the movement of the diaphragm to a small compass. This construction of recorder I have found exceedingly effective in use. The diaphragm is highly sensitive and responds accurately to speech vibrations. The movement of the indenting-point is quite free within exceedingly small limits; but the resistance to its movement increases enormously as the extent of the movement is increased; hence the importance of the fundamental tones in the operation of the instrument is reduced, while the hissing tones which produce movements of a small extent are given an undue importance in the record. This makes the reproduced sound clear and intelligible, since the hissing sounds are brought out clearly and can be distinguished from the scraping noises of the instrument.

It will be observed that the diaphragm is under constant tension and can have no movement at all except that which is permitted by the elasticity of the yielding limit-stop q' . Heretofore the diaphragm of the phonograph-recorder and the indenting point have not been limited in their forward movement, except by the capacity of the diaphragm for vibration. This has permitted strong waves, owing to great momentum and the small amount of energy stored up as a retracting force, to give abnormal and untruthful vibrations to the diaphragm. With my present recorder the diaphragm does not force the lever forward into space, but compresses matter always in contact—viz., the rubber q' ; hence nearly all the work is stored up in the compression of q' to effect the return movement, and momentum becoming a small factor compared to the power stored up, the diaphragm is not given untruthful vibrations. This principle of construction of the recorder I have termed a "closed" or "constrained" system of movement as distinguished from the open or free system of movement heretofore employed.

I do not claim herein the peculiar recorder *per se*, since it is made the subject of a separate application for patent filed March 2, 1888, Serial No. 265,887.

The reproducer which I employ is also an improved instrument of great effectiveness. It has a plate, O, similar to the plate N, which is held removably in the eye m' in the same way that the plate N is held in the eye m . This plate O has an opening, u , through it, which is brought into line with the tube M, for bringing the reproducer into operative relation with the phonogram cylinder. The plate O is recessed at its back and has stretched across it a diaphragm, O' , which is preferably a thin animal membrane. This diaphragm is secured in place by a ring, u' , which is secured to the back of the plate O, while the diaphragm is stretched by another ring, u'' , which has a neck screwing into the opening u of the plate, and is capable of being turned by a tool, so as to stretch the diaphragm O' more or less. To one edge of the ring u' is secured a fine spring-wire, u^3 , which is long enough to reach from the point where it is secured to the center of the diaphragm, and has its inner end turned downwardly, as shown, to follow the spiral line of indentations upon the phonogram. The inner end of this spring wire u^3 is attached to the center of the diaphragm by a strip, u^4 , of rubber. The tendency of the spring-wire is to bend away from the diaphragm, so that it strains the small rubber strip u^4 and places the diaphragm under an initial tension. The movement of the point of the wire u^3 in reproducing is so slight that the strain is never wholly removed from the rubber strip u^4 , and hence the diaphragm is always under tension, which tends to draw it outwardly at the center. This makes the instrument exceedingly sensitive and capable of reproducing sounds accurately. The end of the wire u^3 being rounded and burnished, it will not obliterate the phonogram-record, even though that record is made in quite soft material.

I have found that by connecting the reproducing-point with the diaphragm by a strip of elastic material—such as rubber held under tension—the proper wave motion is transmitted to the diaphragm, but the scratching noises, which seem to require molecular transmission, are largely obliterated.

I do not claim: herein the peculiar reproducer *per se*, since this is made the subject of a separate application for patent filed March 2, 1888, Serial No. 265,888.

The indenting-point of the recorder has an appreciable width, while the reproducing-point of the reproducer is much finer; hence the track of indentations on the phonogram will be much wider than the reproducing-point and the adjustment of the reproducing-point laterally with respect to the indented track need not be extremely accurate. Should the reproducing-point be found to rest only on the edge of the indented track—which will be indicated by imperfect reproduction—the adjustment of one of the screws m^4 while the listening-tube is held to the ear will cause the spectacles to be adjusted so as to bring the reproducing-point sufficiently into the in-

dented track to give the required clearness of reproduction.

It will be observed that both the recorder and reproducer are complete instruments, each in itself, held by a plate readily removable from the machine. This enables these instruments, which are delicate parts of the apparatus, to be readily removed from the machine for repairs, adjustment, or replacement by other similar parts. As has been previously stated, the phonogram-cylinder is slightly tapering. This is also true of the bore of the phonogram-blanks P, which are constructed of a cylinder, *r*, of some hard material and covered with a recording-surface, *s*, of wax or a wax-like substance. The recording-surface *s* is a true cylinder, while, as before stated, the internal bore of the cylinder *r* is tapering to fit the phonogram-cylinder, so that the phonogram-blank can be pushed upon the cylinder and will be held thereon by friction. I propose to make these phonogram-blanks the entire length of the phonogram-cylinder and also to divide such full-length phonogram-blanks into parts, so that sectional phonogram-blanks will be produced, which will be, for illustration, one-fourth, one-half, and three-fourths the length of the full-sized phonogram-blank. All of these sectional phonogram-blanks as well as the full-sized phonogram-blank will have the tapering bore, so that they can be pushed upon the tapering phonogram-cylinder until they bind and the instrument can then be adjusted to them for recording and reproducing.

I do not claim herein a phonogram-blank or phonogram having a recording-surface of wax or a wax-like material, nor such a device when the wax surface is mounted on a backing of tougher material, such features being claimed in my application No. 734, Serial No. 252,964. Neither do I claim herein a phonogram-blank or phonogram having a tapering bore, or such a bore and a cylindrical recording-surface, since these latter features are set forth and claimed in my Patent No. 382,418, dated May 8, 1888.

By having the phonogram-cylinder mounted upon the shaft F outside of the bearing *h* the phonogram-blanks can be slipped onto and off of the cylinder without disturbing any part of the machine. Upon the guide-rest K, I mark a graduated scale, *t*, by which I can set the reproducing-instrument for reproducing from any part of the phonogram.

A phonogram may have upon its surface the record of two or more letters or other papers or memoranda, and a note may be filed with the phonogram stating between what numbers on the scale *t* each letter or memorandum is recorded on the phonogram. This will enable the instrument to be set for reproducing the exact letter or memorandum by adjustment with reference to the scale *t*. As shown in Fig. 4, a pan, R, may be slipped under the phonogram-cylinder G upon the frame A, for receiving the shavings from the phonogram or

phonogram-blank when the cutter L is being used.

For the control of the instrument it is only necessary that a proper circuit-breaker should be placed in the circuit between the battery and the motor, so that the motor can be stopped and started at will. It will be observed that by raising the recorder or reproducer off of the phonogram-cylinder the yielding guide-block *l'*, which takes into the lead-screw *j*, will also be raised out of engagement with the lead-screw, and, although the phonogram-cylinder continues to turn, the recorder or reproducer is not advanced. This enables an operator of the instrument to set the instrument back any distance he may desire to reproduce over again any portion of the matter which he has misunderstood or desires to have repeated.

What I claim as my invention is—

1. In a phonograph, the combination, with the revolving phonogram-carrying shaft and phonogram-cylinder adapted to carry a removable phonogram-blank, of an electric motor having a heavy fly-wheel, armatures carried by such fly-wheel, electro-magnets attracting such armatures, and a commutator, substantially as set forth.

2. In a phonograph, the combination, with the horizontal shaft carrying the phonogram, of a vertical shaft, an electro-magnetic motor mounted upon such vertical shaft, and a beveled friction-gearing transmitting the motion from the vertical shaft to the horizontal shaft, substantially as set forth.

3. In a phonograph, the combination, with the vertical shaft carrying the balance-wheel, electro-magnetic motor, and stepped in a jewel-bearing, of the horizontal phonogram-carrying shaft, and the beveled friction-gearing having one wheel of soft material, substantially as set forth.

4. In a phonograph, the combination of the electro-magnetic motor, consisting of a heavy fly-wheel carrying armatures on its periphery, magnets attracting such armatures, and a commutator with a centrifugal governor controlling the electric circuit of the motor and maintaining a uniform speed of such motor, and a phonogram-carrying shaft connected with the motor by friction-gearing, substantially as set forth.

5. The combination, with the vertical motor-shaft, of the horizontal phonogram-shaft carrying a beveled friction-wheel, and a beveled friction-pinion of soft material mounted on the motor-shaft and pressed against the wheel on the phonogram-shaft by a spring, substantially as set forth.

6. In a phonograph, the combination, with a phonogram-cylinder and advancing screw-thread, of a swinging frame carrying together these separate recorder and reproducer and adapted to bring either into position for operation by the swinging of the frame, substantially as set forth.

7. In a phonograph, the combination, with

the revolving recording-surface, of a swinging spectacle-frame carrying the recorder and reproducer and adapted to be swung so as to bring either into operative relation with the surface, substantially as set forth.

8. In a phonograph, the combination, with a revolving recording-surface, of a swinging frame carrying the recorder and reproducer, and a stationary plate carrying the single speaking or listening tube, the swinging of the frame bringing either the recorder or reproducer into operative relation with the surface and with the speaking or listening tube, substantially as set forth.

9. In a phonograph, the combination, with a revolving phonogram-cylinder, an arm having a movement parallel with the axis of said cylinder, and the reproducer carried by a frame mounted on such arm and adjustable laterally thereon, whereby the reproducer can be readily adjusted to the record, substantially as set forth.

10. In a phonograph, the reproducer carried by a pivoted frame swinging across the lines of record, and an adjusting-screw for determining the lateral position of the reproducer, substantially as set forth.

11. In a phonograph, the combination, with the revolving phonogram-cylinder, of the holding-arm mounted to swing toward and away from the surface of said cylinder, and the reproducer mounted on such arm and laterally adjustable thereon, substantially as set forth.

12. In a phonograph, the combination, with the revolving phonogram-cylinder, of the holding-arm mounted to swing toward and away from the surface of such cylinder, the reproducer mounted on such arm and laterally adjustable thereon, an adjusting-screw for determining the position of the holding-arm relative to the phonogram-cylinder, and an adjusting-screw for determining the lateral position of the reproducer, substantially as set forth.

13. In a phonograph, the combination, with the revolving phonogram-cylinder, of the advancing holding-arm carrying the recorder or reproducer, and a stationary guide-rest for supporting the holding-arm in proper relation with the phonogram-cylinder, substantially as set forth.

14. In a phonograph, the combination, with the revolving phonogram-cylinder, of the advancing holding-arm carrying the recorder or reproducer, a stationary guide-rest for supporting the holding-arm in proper relation with the phonogram-cylinder, and an adjusting-screw for adjusting the height of the holding-arm above the guide rest, substantially as set forth.

15. In a phonograph, the combination, with the phonogram-cylinder and the lead-screw, an arm carrying the recorder or reproducer, a guide-arm connected with the carrying-arm, a yielding guide-block engaging with the lead-

screw, a guide-rest, and an adjusting-screw for adjusting the height of the carrying-arm upon the guide-rest, substantially as set forth.

16. In a phonograph, the combination, with the swinging arm and the recorder or reproducer carried thereby, of the springy back-rest upon which such carrying-arm is thrown, substantially as set forth.

17. In a phonograph, the combination, with the revolving phonogram-cylinder, of the advancing recorder or reproducer, and the scale for determining the position of the recording or reproducing point upon the phonogram or blank, substantially as set forth.

18. In a phonograph, the combination, with the revolving phonogram-cylinder, and recorder and reproducer mounted upon an advancing holding-arm and adjustable toward and away from the phonogram-cylinder, of a cutting-tool movable with such holding-arm and independently adjustable toward and away from the phonogram-cylinder, whereby the recorder and reproducer can be adjusted out of operative engagement with the phonogram-blank, and the cutting-tool can be adjusted forward into engagement with such blank, substantially as set forth.

19. In a phonograph, the combination, with the revolving phonogram-cylinder and the lead-screw, of the arm carrying the recorder or reproducer, a cutting-tool on such arm for reducing the surface of the phonogram or blank, and a guide-arm engaging the lead-screw and advancing the carrying-arm, substantially as set forth.

20. In a phonograph, the combination, with the revolving phonogram-cylinder, of the swinging arm carrying the recorder or reproducer, a cutting-tool also carried by said arm, a guide-rest, a screw for adjusting the position of the recorder or reproducer and said cutting-tool with relation to the phonogram or blank surface, and a yielding guide-block engaging with the lead-screw and advancing said carrying-arm, substantially as set forth.

21. In a phonograph, the combination, with the cylinder-shaft having a fine screw-thread, the phonogram-cylinder mounted on such shaft, a stationary guide-rod, a sleeve mounted on such guide-rod and capable of sliding and turning movements thereon, a guide-arm secured to said sleeve and having a screw-threaded guide-block engaging the screw-thread, and the holding-arm for the recorder or reproducer, also secured to said sleeve, substantially as set forth.

22. In a phonograph, the combination, with the cylinder-shaft having a fine screw-thread, the phonogram-cylinder mounted on such shaft, a stationary guide-rod, a sleeve mounted on such guide-rod and capable of sliding and turning movements thereon, a guide-arm secured to said sleeve and having a screw-threaded guide-block engaging the screw-thread, the holding-arm for the recorder or re-

producer, also secured to said sleeve, and a guide-rest for determining the rotary position of the guide-sleeve, substantially as set forth.

23. In a phonograph, the combination, with
5 the cylinder-shaft having a fine screw-thread, the phonogram-cylinder mounted on such shaft, a guide rod and sleeve, a guide-arm secured to said sleeve and having a screw-threaded yielding guide-block engaging the screw-
10 thread, the holding-arm for the recorder or reproducer, also secured to said sleeve, and a guide-rest for determining the rotary position of the guide-sleeve, substantially as set forth.

24. In a phonograph, the phonogram-cylinder tapering throughout its length, substantially as set forth.

25. In a phonograph, the combination, with the cylinder-shaft mounted in bearings and projecting at one end beyond such bearings, of
20 a smooth surface phonogram-cylinder tapering throughout its length and carried by the shaft outside of its bearings, substantially as set forth.

26. In a phonograph, the combination, with a tapering phonogram-cylinder, of two or more
25 phonogram-blanks of different lengths having tapering bores adapted to fit said phonogram-cylinder and provided with cylindrical recording-surfaces, substantially as set forth.

27. In a phonograph, the combination, with
30 a tapering phonogram-cylinder, of a phonogram having a tapering bore and a cylindrical outer surface held upon said cylinder by friction, substantially as set forth.

28. In a phonograph, the combination, with
35 a holding-frame, of the recording and reproducing devices constructed each as a complete self-contained body removably attached to said holding-frame, substantially as set forth.

This specification signed and witnessed this
40 22d day of November, 1887.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PROCESS OF MAKING PHONOGRAM-BLANKS.

SPECIFICATION forming part of Letters Patent No. 393,462, dated November 27, 1888.

Application filed May 7, 1888. Serial No. 273,038. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Processes of Making Phonogram-Blanks, (Case No. 768,) of which the following is a specification.

As has been made known by my prior applications for patents, the phonogram-blank which I prefer to employ is one made entirely of wax or a wax composition in the form of a cylinder having a cylindrical outer surface and a tapering bore. These blanks I mold from the wax composition, as described in prior applications; but the excessive contraction of the wax in cooling makes it impossible to give such blanks by molding the precise size externally and internally that they should have for use upon my phonograph. I have attempted to reduce these molded blanks to the exact size for use both by pressing them in a finishing-die and also by cutting them both externally and internally with proper tools. These methods of finishing the blanks have, however, objections, which it is the object of my present invention to overcome.

By my present invention I first mold the blank from the wax composition, making it slightly larger than the finished blank, and I then finish the blank by cutting it both externally and internally with heated knives or cutters. These knives or cutters are suitably heated to a temperature slightly below the melting-point of the wax composition; but the rapidity of the cutting operation is such that the wax body of the blank does not melt. For the heated cutting-tools I employ, first, a tapering reamer, which is heated by the introduction of steam into its hollow body and is revolved rapidly. The molded blank is pushed onto this reamer and withdrawn from it by a continuous motion of the hand, so that the reamer by the combined cutting and heating action turns out the bore of the blank to the precise size desired. The second tool is a revolving tapering mandrel having the exact taper of the finished bore of the blank and a heated cutting-knife, which is mounted to be readily moved toward and away from

the mandrel. The blank is placed upon the mandrel and the heated cutting-knife advanced and withdrawn, it being held sufficiently long in its most advanced position to permit the mandrel, which revolves rapidly, to make at least one revolution. This tool by the combined heating and cutting action reduces the external surface of the blank to a true cylinder. The blank is then removed from the mandrel and is ready for use upon the phonograph.

By the use of the heated cutting-tools I find that the wax blanks can be cut rapidly and accurately, and that the surface of the blanks is left perfectly smooth and in good condition for receiving the sound-record and reproducing the sound therefrom. I also preferably heat the wax blanks before cutting by a hot table, oven, or chamber approximately to the temperature of the cutting-tools, so that the blanks will not crack by uneven expansion during the cutting. This is particularly necessary in the case of the reamer, since the blank comes into contact with the tool over a considerable surface. With the heated turning-off tool, however, since only the edge of the knife comes into contact with the wax, the previous heating of the blanks may be dispensed with, although it can be employed.

Any suitable forms of heated cutting-tools can be employed for the purpose, although the cutting-tools shown and described in my applications of even date herewith (Cases Nos. 769 and 770, Serial Nos. 273,039 and 273,040) are preferred by me.

My phonogram-blank being made entirely of the wax composition I employ the heated cutting-tools both upon the bore of the blank and upon its external surface; but it is evident that the invention herein is also applicable to the finishing of the external recording-surfaces of phonogram-blanks, which are composed of a wax coating upon a backing of paper or other suitable material.

What I claim as my invention is—

1. The process of finishing the wax recording-surfaces of phonogram-blanks, consisting in cutting such surfaces with heated cutting-tools, substantially as set forth.

2. The process of finishing cylindrical phono-

1159

2

393,462

gram-blanks made entirely of wax, consisting in cutting such blanks both externally and internally with heated cutting tools, substantially as set forth.

- 5 3. The process of making cylindrical phonogram-blanks entirely of wax, consisting in first molding the hollow blanks and then cutting the blanks both externally and internally

by heated cutting-tools, substantially as set forth.

This specification signed and witnessed this 28th day of April, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

10

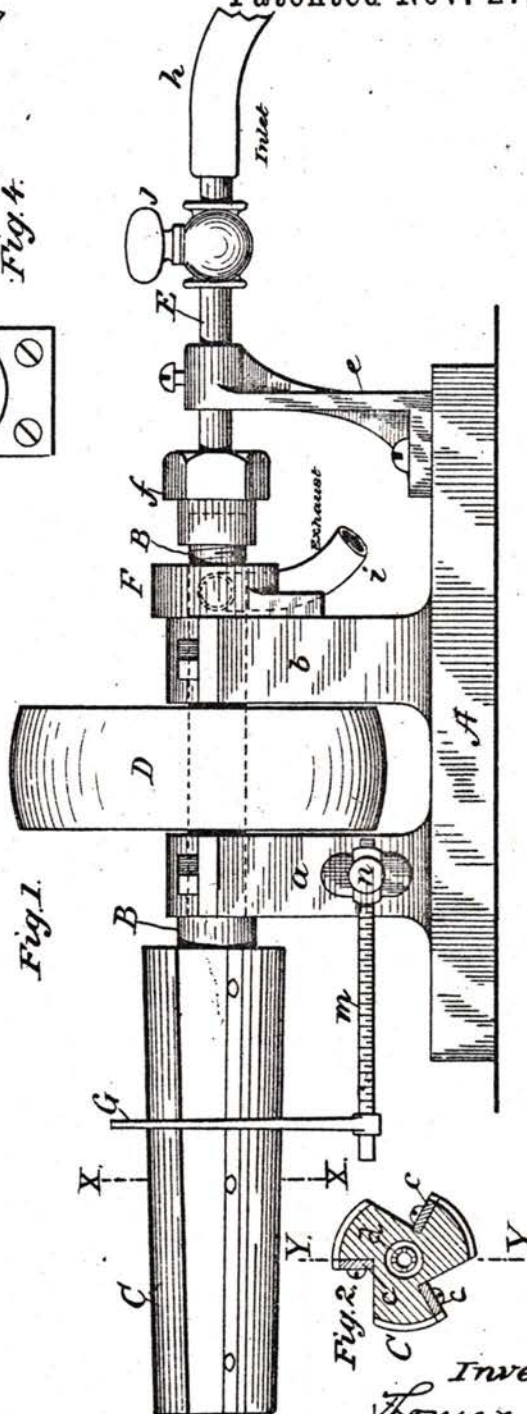
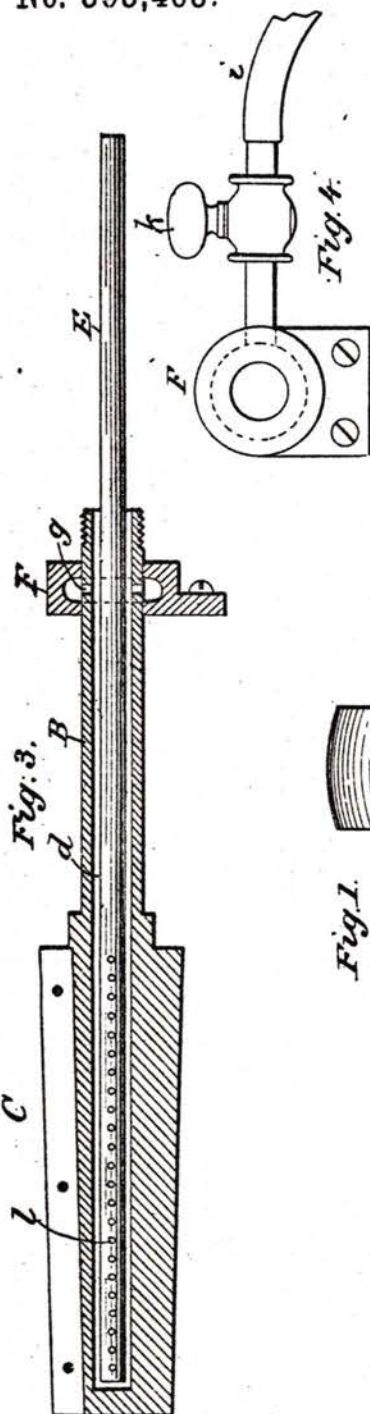
(No Model.)

T. A. EDISON.

MACHINE FOR MAKING PHONOGRAM ELANKS.

No. 393,463.

Patented Nov. 27, 1888.



Witnesses:
J. H. Mudd
William Alger

Inventor:
Thomas A. Edison
 By *Dyer & Leely*
 Attorneys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

MACHINE FOR MAKING PHONOGRAM-BLANKS.

SPECIFICATION forming part of Letters Patent No. 393,463, dated November 27, 1888.

Application filed May 7, 1888. Serial No. 273,039. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Machines for Making Phonogram-Blanks, (Case No. 769,) of which the following is a specification.

As has been made known by my prior applications for patents, the phonogram-blank which I prefer to employ is one made entirely of wax or a wax composition in the form of a cylinder having a cylindrical outer surface and a tapering bore. These blanks I first mold from the wax or wax composition; but owing to the excessive contraction of the wax in cooling the blanks are somewhat distorted and do not have the accurate shape and size required. Hence it becomes necessary to mold the blanks slightly larger than the size for the finished blanks and then to reduce them by cutting to the proper size and shape, both externally and internally. I have found that the use of the ordinary cutting-tools at ordinary temperatures for this purpose is objectionable. In my application of even date herewith, (Case No. 768, Serial No. 273,038,) I have described a method of finishing these blanks consisting in cutting them externally and internally with heated knives or cutters.

The object of my present invention is to provide a proper tool for reaming out the wax phonogram-blank, so as to make its bore accurately of the size and shape desired.

In the accompanying drawings, forming a part hereof, Figure 1 is a side elevation of the improved reamer. Fig. 2 is a cross-section on the line *x x*. Fig. 3 is a longitudinal section through the reamer and its shaft on the line *y y*; and Fig. 4 is an elevation of the exhaust-outlet for the heating medium.

A is a suitable base or table, from which rise pedestals *a b*, in which is journaled the shaft B, carrying the tapering reamer C. Upon the shaft between the pedestals is the pulley D, by means of which power is applied to the reamer for revolving it rapidly. The reamer C is made tapering, it having the exact size and shape it is desired to give the bore of the wax phonogram-blank. It is provided with cutting-knives *c*. The shaft B and reamer C are made

hollow, the passage or channel *d* extending entirely through the reamer, but being closed at the small end of the reamer. Into the channel *d* is introduced centrally a stationary pipe, E, which is rigidly held by a bracket, *e*, rising from the base A, out of contact with the sides of the channel *d*, so that the reamer C and shaft B can be revolved while the pipe E is held at rest. The shaft B terminates between the pedestal *b* and bracket *e*, and is provided with a stuffing-box, *f*, which closes the opening *d* around the pipe E at this point. Secured to the outer face of the pedestal *b* is a box or chamber, F, which fits closely around the shaft B, such shaft being provided with a number of perforations, *g*, where it is covered by this box. The pipe E and the box F are connected with leading-pipes *h i*, provided with stop-cocks *j k*. A heating medium, which is preferably steam, but may be hot water or hot air, is supplied to the pipe *h* and passes into the pipe E at its other end within the reamer C, and then passes out of such pipe E through its open end and through the perforations *l* in such pipe E into the channel *d* around the pipe E, and thence returns through such channel *d* to the perforations *g*, and out of such perforations into the box F, and thence out by the pipe *i*, the flow of the heating medium being controlled by the stop-cocks *j k*. Thus the reamer can be maintained at the precise temperature desired.

To determine the extent to which the wax phonogram-blank will be pushed upon the reamer, I provide a gage-arm, G, which passes over the reamer and is screwed to an arm, *m*, held by a set-screw, *n*, to the side of the pedestal *a*. By means of the set-screw *n* the gage-arm G can be set to any point desired. The arm *m* may have a scale marked upon it to indicate the position to which the gage-arm is set. This enables me to ream out phonogram-blanks of different lengths.

The hollow cylindrical wax phonogram-blanks are taken in the hand and are pushed onto the reamer and withdrawn from it by a continuous motion, the reamer being brought up to the desired temperature and the combined action of heating and cutting rapidly and smoothly reaming out the bore of the blank.

The wax blanks are preferably heated by a

hot table, oven, or chamber approximately to the temperature of the reamer before being cut by the reamer, in order to prevent cracking by unequal expansion.

5 What I claim as my invention is—

1. A revolving reamer having cutting knives or edges, and provided with means for heating it, substantially as set forth.

10 2. A revolving reamer having cutting knives or edges, and made hollow, in combination with pipe connections for introducing a heating medium into the hollow reamer, substantially as set forth.

3. The combination, with a revolving shaft, B, and reamer C, made hollow, of a stationary 15 pipe, E, and the box F, substantially as set forth.

This specification signed and witnessed this 28th day of April, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

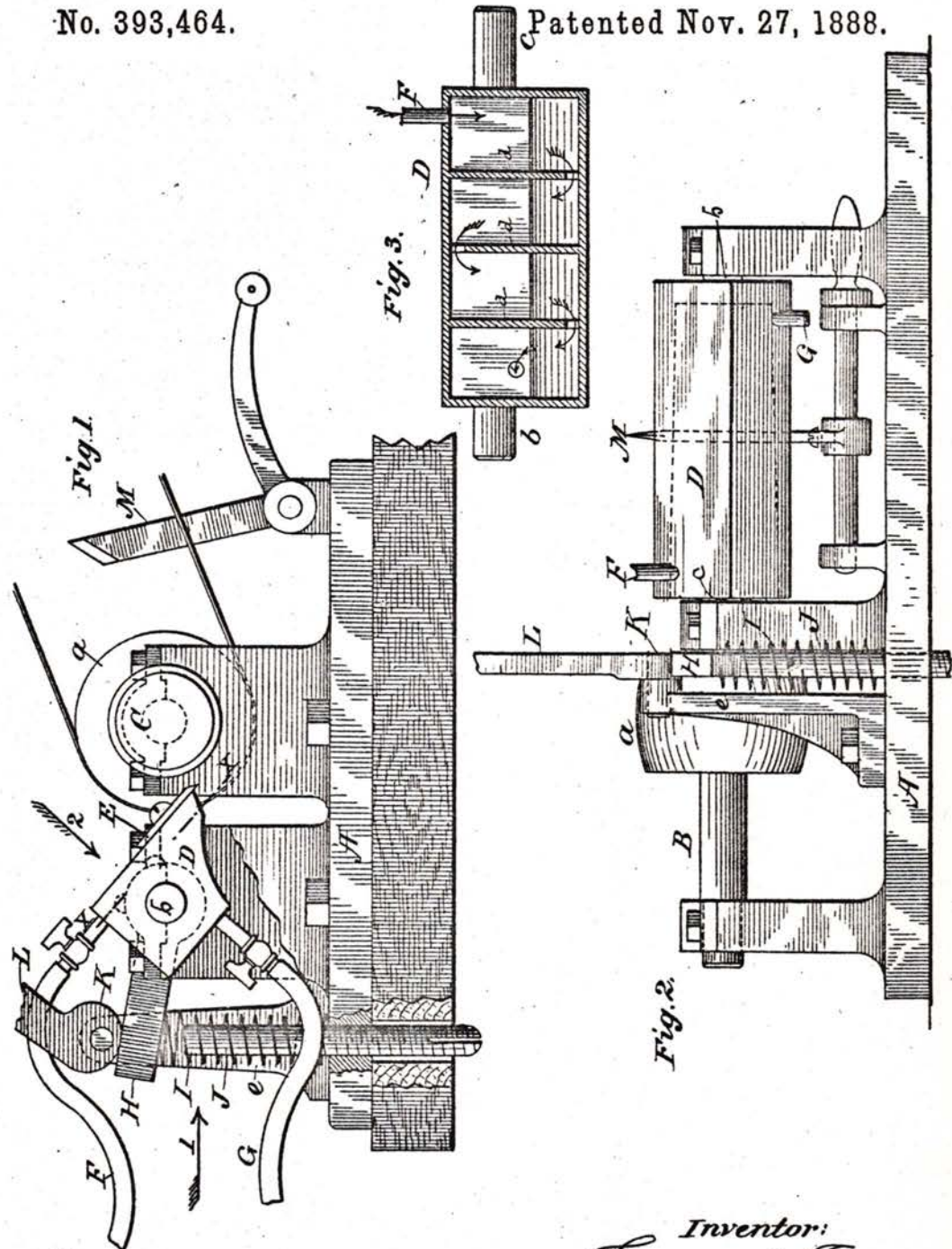
(No Model.)

T. A. EDISON.

MACHINE FOR MAKING PHONOGRAM BLANKS.

No. 393,464.

Patented Nov. 27, 1888.



Witnesses:

J. H. Mudge
William F. Fyfe

Inventor:

Thomas A. Edison

By

Dyer & Leely
 Attorneys

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

MACHINE FOR MAKING PHONOGRAM-BLANKS.

SPECIFICATION forming part of Letters Patent No. 393,464, dated November 27, 1888.

Application filed May 7, 1888. Serial No. 273,040. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Machines for Making Phonogram-Blanks, (Case No. 770,) of which the following is a specification.

As has been made known by my prior applications for patents the phonogram-blank which I prefer to employ is one made entirely of wax or a wax composition in the form of a cylinder having a cylindrical outersurface and a tapering bore. In finishing the outer surfaces of these blanks I have found that the cutting of the wax with ordinary tools at ordinary temperatures is objectionable.

In an application for patent of even date herewith (Case No. 768, Serial No. 273,078) I have described a method of finishing the wax surfaces of phonogram-blanks, consisting in cutting such surfaces with heated knives or cutters.

The object of my present invention is to provide a suitable machine for this purpose.

In the accompanying drawings, forming a part hereof, Figure 1 is an end view of the machine. Fig. 2 is a side elevation looking in the direction of arrow 1 in Fig. 1, and Fig. 3 is a section of the heating-box on line *x x*, looking in the direction of arrow 2 in Fig. 1.

A is a suitable base or table carrying bearings on which the shaft B is mounted. Outside of the bearings is the mandrel C, and between the bearings the pulley *a*, by which the mandrel is rotated. This mandrel C is adapted to receive the cylindrical phonogram-blank made of wax or having a wax-coated external surface. Parallel with the mandrel C is arranged a box, D, having trunnions *b c*, which are mounted in bearings in suitable supports rising from the base A, and is adapted to be swung on such trunnions. Upon the upper forward edge of the box D is secured a cutting-knife, E, which, by the swinging of the box D on its trunnions, is moved toward and away from the mandrel C. The box D is provided with inlet and outlet pipe connections F G, made flexible to permit of the movement of the box D, and having stop-cocks, as shown. These

pipes supply a heating medium—such as steam, hot water, or hot air—to the box D, such medium being caused to have a circuitous route through the box D by means of the partitions *d*, as shown in Fig. 3. To the trunnion *c* of the box D is secured a rearwardly-projecting arm, H, which is pressed upwardly by a spring, I, and is limited in its downward movement by an adjustable stop, J, which may be a screw passing upwardly through the base A. Bearing on the upper side of the arm H, at its outer end, is a cam, K, carried by the end of a hand-lever, L, which is pivoted to a bracket, *e*, rising from the base A. The cam K limits the upward movement of the arm H, and hence limits the extent of withdrawal of the knife E from the mandrel C, which withdrawal is effected by the upward pressure of the spring I, while the adjustable stop J, by limiting the downward movement of the arm H, also limits the forward movement of the knife E. It will thus be seen that by adjusting the stop J the precise position to which the knife E will be advanced by turning the cam K by means of the handle L will be fixed. The heating medium being supplied to the box D and regulated by the stop-cocks, such box will be brought to the desired temperature, which is slightly below the melting-point of the wax or wax composition. The phonogram-blank will be pushed upon the mandrel C, and such mandrel will be started revolving, when by a quick movement of the handle L the heated knife E will be thrown forward against the wax surface of the phonogram-blank, and the blank will be turned true by the combined action of heating and cutting, when the blank will be removed from the mandrel and another substituted in its place.

The machine may be provided with a swinging knife, M, for cutting the phonogram-blanks into two or more lengths; but such a knife is not an essential feature of the machine.

What I claim as my invention is—

1. The combination, with a revolving mandrel, of a heated cutting-tool for turning off the external surface of a wax phonogram-blank mounted on such mandrel, substantially as set forth.

2. The combination, with a turning man-

drel, of a moving box having pipe connections for supplying it with a heating medium, a knife mounted upon such box, and a handle for moving the box toward and away from the mandrel, substantially as set forth.

3. The combination, with a turning mandrel, of a pivoted box, pipe-connections for supplying a heating medium to said box, a cutting-knife mounted upon the box, and a handle for turning said box so as to move the knife toward and away from the mandrel, substantially as set forth.

4. The combination, with a revolving mandrel, of a pivoted box, pipe-connections for supplying a heating medium to the box, a knife mounted on the box, a handle swinging said box so as to move the knife toward the mandrel, and a spring turning the box in the opposite direction to move the knife away from the mandrel, substantially as set forth.

5. The combination, with a turning mandrel, of a pivoted box carrying a knife and having pipe-connections for supplying it with a heating medium, a handle swinging the box, so as to move the knife toward the mandrel, and an adjustable stop limiting the forward movement of the knife, substantially as set forth.

6. The combination, with a turning mandrel, C, of a swinging box, D, carrying a knife, E, and having pipe-connections F G, the arm H, the cam K, turned by handle L, the spring I, and the adjustable stop J, substantially as set forth.

This specification signed and witnessed this 28th day of April, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

1166

(No Model.)

T. A. EDISON.

METHOD OF PREPARING PHONOGRAPH RECORDING SURFACES.

No. 393,465.

Patented Nov. 27, 1888.

FIG. 1.

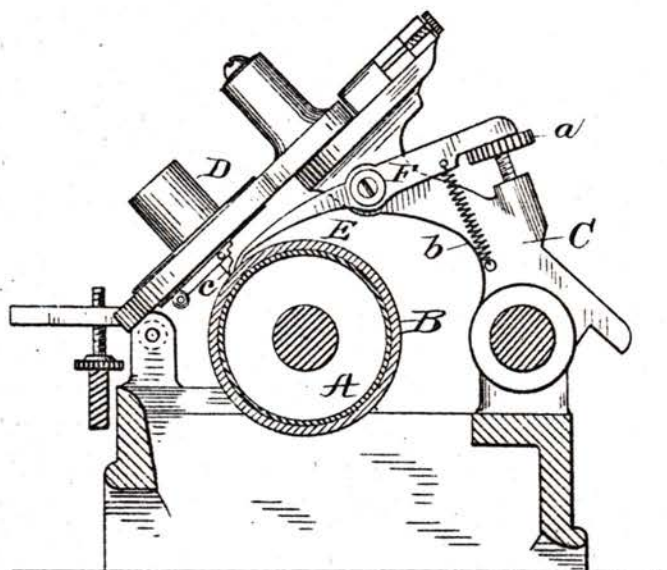


FIG. 3.

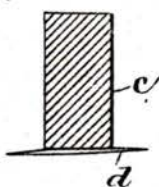


FIG. 2.

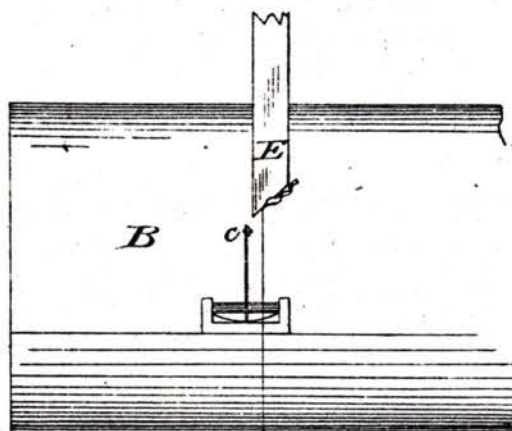
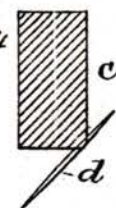


FIG. 4.



Witnesses.
Ed. Rowland
William P. Egan

Inventor,
Thomas A. Edison
 By his Attorneys *Dyer & Seely*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

METHOD OF PREPARING PHONOGRAPH RECORDING-SURFACES.

SPECIFICATION forming part of Letters Patent No. 393,465, dated November 27, 1888.

Application filed July 7, 1888. Serial No. 279,323. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Improvement in the Method of Preparing Phonograph Recording-Surfaces, (Case No. 785,) of which the following is a specification.

In my phonograph I employ a removable
10 phonogram-blank having a recording-surface of a yielding material. I prefer to use a wax or a wax composition for the purpose, and I also prefer to make the entire blank of the wax or wax composition. These blanks after being
15 mounted in the machine have their recording-surface turned true by a knife which is carried by the rocking holding-arm and the point of which is preferably in close proximity to the recording-point. The blanks used with
20 my machine are also preferably adapted to have their surfaces turned off by this same cutting-tool for the purpose of using them a number of times, an old record being removed to make place for a new one. I have heretofore
25 employed as the cutting-tool a knife with its cutting-edge parallel with the axis of the phonogram-cylinder and practically at right angles to the track of record. I have discovered that wax and similar yielding materials,
30 by reason of their elasticity and the cohesion of the particles, are not turned off smoothly by the tool, but that microscopic cracks or breaks in the surface are formed which are parallel with the edge of the cutting-tool. To
35 these cracks or breaks I attribute, in a measure, the production of foreign sounds by the record. These cracks or breaks are not as deep as the track made by the recording-point, but since the recording-point meets at the one
40 time the resistance due to material of the full depth of its incision and at another time (when crossing a crack or break in the surface) a lesser body of material I have found that the record produced is correspondingly affected,
45 having irregularities causing false vibrations in the reproducer. I have found that the effect of these cracks or breaks is greatly modified and the trouble arising from them largely overcome by so cutting or turning off the surface of the blank that the cracks will be ob-

lique to the track of record or the direction of relative movement of the surface and the recording-point. The improved effect, I think, is due to the fact that when the cracks are oblique the recording-point does not meet the
55 crack across the full width of its advancing edge at one time, but only across a portion of such edge, and the disturbance is more gradual and is extended over a greater time.

In the accompanying drawings, forming a
60 part hereof, Figure 1 is a vertical transverse section of a phonograph provided with a turning-off tool; Fig. 2, a view showing the phonogram-blank being cut by the tool and illustrating the relative positions of the cutting-
65 tool and the recording-point; and Figs. 3 and 4 are views on an exaggerated scale showing the relation between the recording-point of the phonograph and the cracks in the recording-surface.

A is the revolving phonogram-cylinder, having the wax phonogram-blank B carried thereby.

C is the rocking holding-arm carrying the recorder D and the cutting-tool E. This tool
75 is a knife mounted on the end of a lever, F, pivoted to the arm C. The end of the lever F in rear of the pivot passes over the head of an adjusting-screw, a, while a spring, b, draws it downwardly against said screw. The point
80 of the knife E is oblique, as shown in Fig. 2, the cracks produced in the wax recording-surface by it being oblique to the track of record made by the point c of the recorder.

In Figs. 3 and 4 is shown in horizontal section the recording-point c, while d represents
85 the cracks in the recording-surface. If those cracks are parallel with the advancing edge of the recording-point, as shown in Fig. 3, the recording-point will meet the cracks at the same time across the full width of its advancing edge, while if the cracks are oblique, as in
90 Fig. 4, only a portion of the advancing edge of the recording-point will be in the crack at any one time, and the disturbing effect of the crack will be distributed over a greater space
95 of time, and hence will be more gradual.

It will be understood that the cutting-tool is to be used either alternately with the recorder or simultaneously therewith. In the 100

latter case the cutting-tool is placed somewhat in advance of the recording-point in the direction of longitudinal movement of said point, as is illustrated in Fig. 2.

5 I do not claim in this application the recording-point and cutting-tool adapted to be operated simultaneously, this being claimed in my application filed May 29, 1888, Serial No. 275,441.

10 In my application No. 784, Serial No. 279,322, filed July 7, 1888, I have claimed the phonograph provided with a turning-off tool having a cutting-edge oblique to the track of record. This application relates to the method
15 of preparing phonograph recording-surfaces by means of an oblique cutting-edge. It is obvious that the method might be carried into effect without mounting the cutting-tool upon the phonograph itself, since such tool might

be employed in any suitable machine, such as 20 a lathe or any modification of a lathe.

What I claim is—

1. The method of preparing phonograph recording-surfaces, consisting in turning off such surfaces by a tool having a cutting-edge acting 25 obliquely to the track of record, substantially as set forth.

2. The method of preparing phonograph recording-surfaces of wax or a wax composition, consisting in turning off such surfaces by a tool 30 having a cutting-edge acting obliquely to the track of record, substantially as set forth.

This specification signed and witnessed this 30th day of June, 1888.

THOS. A. EDISON.

Witnesses.

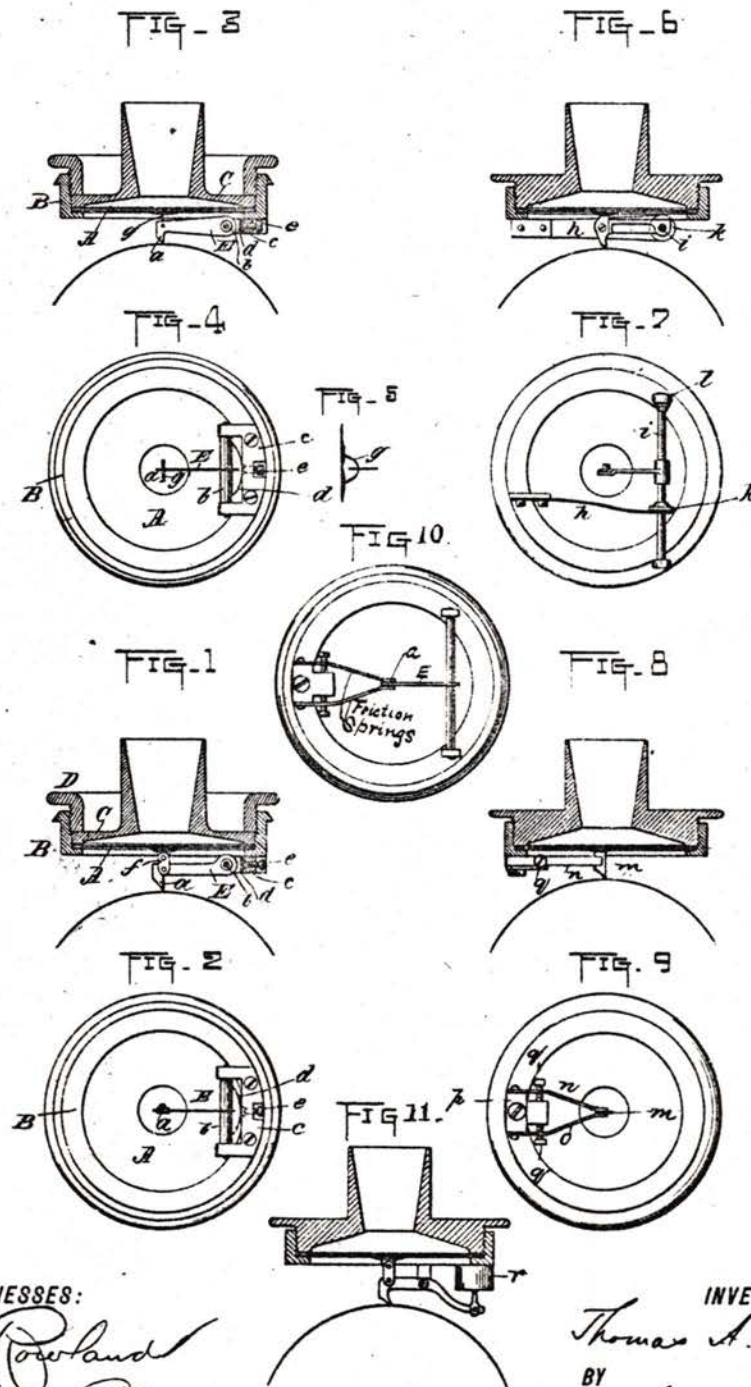
WILLIAM PELZER,
A. W. KIDDLE.

(No Model.)

T. A. EDISON.
PHONOGRAPH RECORDER.

No. 393,466.

Patented Nov. 27, 1888.



WITNESSES:

E. C. Rowland
William Egan

INVENTOR.

Thomas A. Edison

BY

Dyer & Leely
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH-RECORDER.

SPECIFICATION forming part of Letters Patent No. 393,466, dated November 27, 1888.

Application filed July 17, 1888. Serial No. 280,207. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex, in the State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Recorders, (Case No. 789,) of which the following is a specification.

In experimenting with my phonograph I have discovered that imperfections are produced in the record made by the machine by reason of the momentum of the recorder-diaphragm and attached parts; also by reason of lost motion when the recording-point is mounted on a pivoted lever, as I prefer to mount it, and also by reason of the straining of the diaphragm, due to the attachment of the recording-point to such diaphragm, and due to the differences in the directions of movement of the recording-point and the diaphragm. These imperfections in the record become audible, as scratching and other foreign noises, when the sounds are reproduced.

The object I have in view is to overcome these defects in phonograph-recorders, with the result of making the reproduced sounds more clear, and also permitting the employment of a more sensitive reproducer.

In constructing my phonograph-recorder I make a positive connection between the diaphragm and the recording-point, so that there will be no loss of movement in communicating the vibrations of the diaphragm to the recording-point. The recording-point is mounted upon a rigid lever or arm which takes the lateral thrust of the recording-point and relieves the diaphragm from the strain due to said thrust. This rigid carrying-lever is also preferably a short lever, and is mounted to turn in bearings, so that the movement of the recording-point will be oblique to the recording-surface for the purpose of making the recording-waves more abrupt at one end than at the other.

In the preferred construction of my phonograph-recorder the lever carrying the recording-point is pivoted, as just stated, one or more of the pivotal bearings being friction-bearings having a considerable pressure exerted upon them, so that the movements of the lever, the recording point, and the diaphragm will be retarded by the friction-bearings, thus

overcoming the momentum of the parts. The lever is also made extremely light by making it from a thin plate, it having sufficient width to give the desired rigidity which is required to take the lateral thrust of the recording-point. The friction at the bearings of the pivotal lever is preferably obtained by means of a spring placed under tension, and this spring-tension is also preferably adjustable, so that the requisite amount of pressure can be obtained. The pressure of the spring on the bearings of the lever also serves to take up any lost motion. To prevent the positive attachment of the indenting-point with the diaphragm from straining the diaphragm, I make the connection one which is capable of yielding in the direction of the length of the carrying-lever. This connection is preferably a link pivoted to the lever, as well as to a block, cemented or otherwise secured to the diaphragm. Where the recording-point is supported directly from the diaphragm, no supporting lever or arm being employed, the retardation necessary to overcome the momentum may be produced by means of friction-springs which embrace the recording-point bearing against its opposite sides. This way of applying the friction may also be used when the recording-point is mounted upon an arm or lever. Instead of employing friction-springs for producing the retardation a dash-pot may be employed for the purpose. It will be seen that all these retarding devices are non-resilient and constant in their action and do not change the character of the vibrations of the diaphragm, which are given it by the sound-waves, but only serve to retard the movement and thus to overcome the momentum. The elastic or resilient dampening devices that have heretofore been used with diaphragms of phonographic apparatus produce quite a different effect from the non-resilient retarding devices, since by reason of their resiliency they change the character of the diaphragm vibrations and produce false movements which serve to injure rather than improve the character of the record.

In the accompanying drawings, forming a part hereof, Figure 1 is a vertical section of the preferred form of my recorder. Fig. 2 is a bottom view of the same. Fig. 3 is a vertical section of the recorder, showing a modifi-

cation of the connection between the carrying-lever and the diaphragm. Fig. 4 is a bottom view of the recorder of Fig. 3. Fig. 5 is a section through the center of the diaphragm of the recorder of Figs. 3 and 4, showing in elevation the connection between the carrying-lever and the diaphragm. Fig. 6 is a vertical section of a recorder showing a modified way of producing the retarding-friction. Fig. 7 is a bottom view of the recorder of Fig. 6. Fig. 8 is a vertical section of a recorder having the recording-point supported from the diaphragm. Fig. 9 is a bottom view of the recorder of Fig. 8. Fig. 10 is a bottom view of a recorder having the recording-point supported by a lever and having the friction-springs bearing directly on the point; and Fig. 11 is a side view of a recorder showing the employment of a retarding dash-pot.

With reference to Figs. 1 and 2, which show the preferred form of my phonograph-recorder, the diaphragm A of my recorder is preferably a thin plate of microscope-glass which is clamped between plates B C by means of the adjusting-ring D, the edges of the glass diaphragm being protected by rubber rings. The recording-point *a* is preferably mounted upon or forms part of a lever, E, which is made from thin plate metal in order to give it lightness. This lever E is mounted upon a long bearing-pin, *b*, which is pivoted in the ends of a yoke, *c*, secured rigidly to the bottom of the ring B. Between the back of yoke *c* and the bearing-pin *b* is a semi-elliptical spring, *d*, which bears against the bearing-pin *b* and is adjusted in its tension by means of a screw, *e*, passing through the back of the yoke and setting against the center of the spring. The lever E is connected with the center of the diaphragm by means of a link, *f*, which is pivoted to the lever and is also pivoted to a small metal block which is cemented to the center of the diaphragm.

The tension of the spring *d* produces considerable friction at the bearings of the pin *b*, and hence the movements of the diaphragm, the recording-point, and the carrying-lever are retarded by this friction, and the momentum of these parts is thereby overcome. All lost motion at the bearings is also taken up by means of the tension of this spring. The pivoted link *f* forms a positive connection between the recording-point and the diaphragm, so that the movements of the diaphragm are communicated positively to the recording-point. At the same time this link *f* is yielding in the direction of the length of the carrying-lever, so that the diaphragm will not be strained by the difference in direction of movement of the recording-point and the diaphragm. This positive connection, which is yielding at right angles to the direction of movement of the diaphragm, also prevents the straining of the diaphragm, which would be due to cementing a rigid attachment to it. It will be seen that if the link *f* were rigidly connected with

the lever E the effect would be to strain the diaphragm in cementing this rigid connection to it, since the diaphragm would be pressed in by the link in securing the cement, and when it resumed its normal position there would be a strain between the diaphragm and the connection.

In Figs. 3, 4, and 5 is shown the same instrument as that just described in connection with Figs. 1 and 2, with the exception that the link *f* is supplanted by an arch, *g*, of wire, which is cemented at two points to the diaphragm and passes through the end of the lever E. This arch is practically rigid in the direction of the movement of the diaphragm, thus forming a positive connection between the diaphragm and the recording-point, while it is capable of yielding in the direction of the length of the lever E, thus preventing the strain of the diaphragm.

In Figs. 6 and 7 the friction is produced by means of a spring, *h*, which is secured to one side of the bottom of the ring B. It crosses such ring and has a forked end which embraces the long bearing-pin *i*, and bears with considerable pressure against a friction-disk, *k*, upon such bearing-pin. This pressure of the spring *h* on the disk *k* forces the bearing-pin *i* longitudinally against its bearing *l* at one end, which may be provided with a friction-washer of leather or other suitable material. In this recorder the recording-point is shown as directly connected with the diaphragm by cement, which construction may be employed, but is not as efficient as the yielding positive connection before described.

In Figs. 8 and 9 is shown a recorder having the recording-point *m* supported directly by the diaphragm, there being no lever or arm to take the lateral thrust. The retardation is produced by means of two friction-springs, *n* *o*, which are secured to a block, *p*, attached to the ring B of the recorder, and embrace at their inner end the recording-point *m*, upon the opposite sides of which they bear with considerable pressure, so that the recording-point in moving will be retarded by the friction of the springs on its sides. Adjusting-screws *q* may be used to adjust the pressure of these friction-springs. The same way of producing the friction may be employed with recording-points mounted upon levers, as shown in Fig. 10. This form does not take up the lost motion at the pivots of the lever; but the friction being applied directly to the recording-point the retarding action is effectively produced.

In Fig. 11 a small dash-pot, *r*, connected with the outer end of the lever carrying the recording-point, is employed to retard the momentum of the parts.

As before stated, it will be observed that all the retarding devices are non-resilient in their action and afford a constant resistance to the movement of the parts at every point, in this respect differing widely from the dampening devices that have been heretofore employed.

What I claim as my invention is—

1. In phonograph-recorders, the combination, with the diaphragm, of the recording-point connected therewith, and a non-resilient
5 retarding device for overcoming the momentum of the diaphragm and attached parts by constantly retarding the movement in both directions, substantially as set forth.

2. In phonograph-recorders, the combination,
10 with the diaphragm, of the recording-point attached thereto, a lever or arm by which said recording-point is carried, and a non-resilient retarding device for overcoming the momentum of the diaphragm and attached parts
15 by constantly retarding the movement in both directions, substantially as set forth.

3. In phonograph-recorders, the combination, with the diaphragm, of the recording-point connected thereto, and a pivoted lever
20 carrying such recording-point and having one or more friction-bearings, substantially as set forth.

4. In phonograph-recorders, the combination, with the diaphragm, of the recording-point connected thereto, a pivoted lever carrying said recording-point, and a spring producing friction at the bearings of the lever and

taking up the lost motion, substantially as set forth.

5. In phonograph-recorders, the combination,
30 with the diaphragm, of the recording-point connected thereto, a pivoted lever carrying the recording-point, and an adjustable spring-friction exerted upon said lever, substantially as set forth.

6. In phonograph-recorders, the combination, with the diaphragm, of the recording-point, a lever or arm carrying such recording-point, and a positive connection between the recording-point and the diaphragm, such connection being constructed to yield in the direction of the length of the carrying-lever, substantially as set forth.

7. In phonograph-recorders, the combination, with the diaphragm, of the pivoted lever
45 carrying the recording-point, and the link connecting such lever with the diaphragm and pivoted at both ends, substantially as set forth.

This specification signed and witnessed this 14th day of July, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

(No Model.)

3 Sheets—Sheet 1.

T. A. EDISON.

METHOD OF RECORDING AND REPRODUCING SOUNDS.

No. 393,966.

Patented Dec. 4, 1888.



FIG. 1



FIG. 2



FIG. 3



FIG. 4

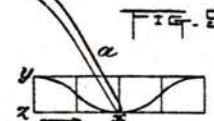


FIG. 5

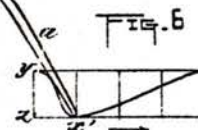


FIG. 6

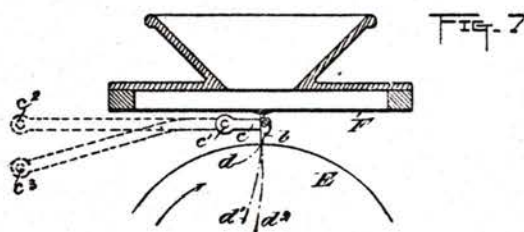


FIG. 7

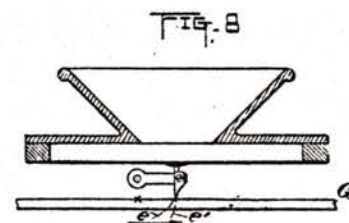


FIG. 8

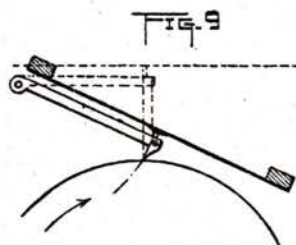


FIG. 9

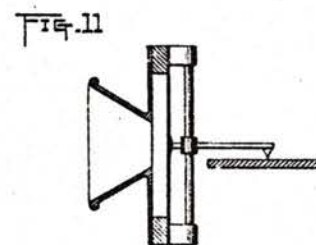


FIG. 11

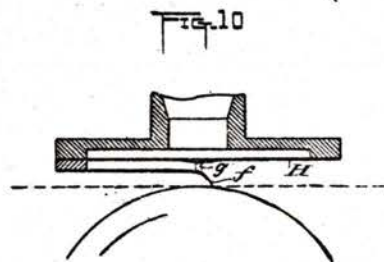


FIG. 10

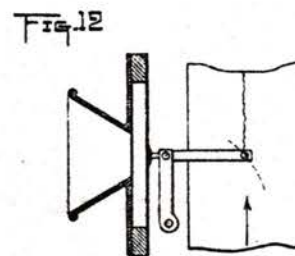


FIG. 12

WITNESSES:

E. L. Rowland
William R. Rye

INVENTOR,

Thomas A. Edison.
 BY *Dyer & Seely,*
 ATTORNEYS.

1174

(No Model.)

3 Sheets—Sheet 2.

T. A. EDISON.

METHOD OF RECORDING AND REPRODUCING SOUNDS.

No. 393,966.

Patented Dec. 4, 1888.

Fig. 13

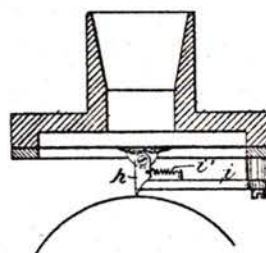


Fig. 14

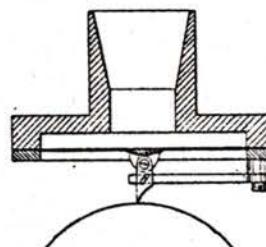
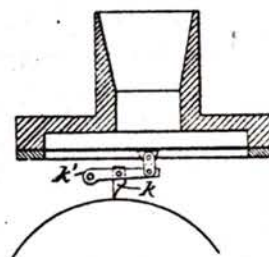


Fig. 15



WITNESSES:

E. C. Rowland.
William F. Fyfe.

INVENTOR

Thomas A. Edison

BY

Syer & Lecky
ATTORNEYS

1175

(No Model.)

3 Sheets—Sheet 3.

T. A. EDISON.

METHOD OF RECORDING AND REPRODUCING SOUNDS.

No. 393,966.

Patented Dec. 4, 1888.

FIG. 16

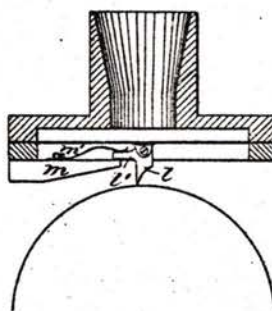
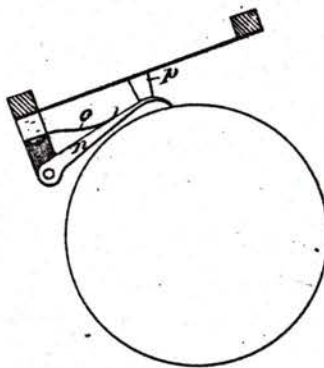


FIG. 17



WITNESSES:

C. L. Rutland
William P. Felt

INVENTOR,

Thomas A. Edison,

BY

Dyer & Leely,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

METHOD OF RECORDING AND REPRODUCING SOUNDS.

SPECIFICATION forming part of Letters Patent No. 393,966, dated December 4, 1888.

Application filed July 17, 1888. Serial No. 280,204. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in the Art of Recording and Reproducing Sounds, (Case No. 786,) of which the following is a specification.

As is well understood, the phonograph invented by me, and the various modifications of my early instruments that have been made by others as well as by myself, operate to record speech, music, and other sounds by impressing a solid or semi-solid material with wave-lines corresponding with the sound-waves, the sounds being reproduced from these recorded wave-lines by causing them to vibrate an elastic solid, such as a diaphragm.

To illustrate by reference to a usual form of the apparatus, a diaphragm carrying an indenting-point is held so that the point will form a groove in the surface of a moving body of suitable material, such as a cylinder of wax. The vibrations of the diaphragm cause the indenting-point also to vibrate and to correspondingly vary the depth of the groove, thus forming the wave-line, from which the sound is reproduced by drawing the surface again under the same or a different point attached to a diaphragm.

All phonographs heretofore made have been unsatisfactory in the respect that they lacked clearness and loudness of articulation. This I have found is due more particularly to the fact that they failed to bring out clearly the hissing sounds, thus making words which depend upon such sounds for their characteristics generally unintelligible, except by aid of the context. An examination of such phonograph-records microscopically shows that the recorded waves are symmetrical in shape, each wave rising and falling on the same gradual sinuous curve. The waves for the hissing sounds also appear longer and of less depth, and hence more gradual in their rise and fall, than those for vowel sounds.

In my investigations and experiments with telephonic apparatus of various kinds I have observed that the loudness of the sound produced in a telephone-receiver by a current impulse is dependent upon the sharpness of the impulse rather than upon its strength.

The circuit from a hundred cells of battery can be closed through a telephone-receiver without producing sound, providing the wave is made one having a gradual and uniform rise by placing a suitable magnet in the circuit, to taper the wave by its self-induction, while a sharp impulse from a single cell will produce a noise in the receiver which can be heard for some distance. Hence I have concluded that the imperfection of phonograph-records arises from the symmetrical and gradual rise and fall of the recorded waves, and especially of the recorded waves representing hissing sounds, which do not move the reproducing-diaphragm with sufficient abruptness to reproduce the sound-waves with clearness. To overcome this difficulty I modify the form of the recorded waves, so that instead of being a simple sinuoidal symmetrical curve with the greatest depth at the center of each recorded wave, the recorded waves will be more abrupt at one end than at the other. This I accomplish by controlling the movement of the recording-point with reference to the relative movement of such point and the recording-surface. Instead of acting perpendicular to the line of advancing movement, the recording-point moves oblique to such line, so that in one direction the recording-point moves to some extent with the recording-surface and in the other direction such point moves to some extent against or opposite to the movement of the recording-surface. By regulating these relative movements I have found that the recorded waves can be given the desired abruptness at one end—i.e., the point of greatest depth of the recorded wave can be transferred from the center of the wave to near either end. I have found it preferable to make this abruptness at the end rather than at the beginning of each wave, since in the former case the reproducing-point passes down the gradually-declining side of the wave to its extreme depth, and then rises suddenly at the end of the wave without producing audible disturbances of the recorded sound, while in the former case false sounds are produced, which I attribute to the jumping of the reproducing-point off of the abrupt corner of the recorded wave and its striking the bottom of the wave with sufficient force to rebound, making false vibrations which are audible.

This invention of modifying the form of the recorded waves, so as to give abrupt movements of the reproducing-point, is capable of being carried out in practice in a great variety of ways, a few only of which are shown by the drawings for purposes of illustration, and these, for clearness, are shown principally in diagram, the general features of the apparatus being well understood.

Figures 1 and 2 represent on an exaggerated scale, respectively, the form of the recorded waves for vowels and hissing sounds in phonograph-records heretofore produced. Figs. 3 and 4 represent on an exaggerated scale the form of the recorded waves for vowels and hissing sounds produced by the employment of this invention. Figs. 5 and 6 are views illustrating the dynamic effects of the pure and modified waves. Fig. 7 is a view, principally in diagram, illustrating a suitable arrangement for the recorder indenting-point, with dotted lines to show the effect of changing the location of the pivot of the lever which carries such indenting-point. Fig. 8 is a view similar to Fig. 7, but showing a flat instead of a cylindrical recording-surface. Fig. 9 is a view illustrating the accomplishment of the same end by arranging the recorder oblique to the recording-surface. Fig. 10 is a view illustrating the use of a reproducer with records such as would be produced by the arrangements of Figs. 7, 8, and 9. Figs. 11 and 12 are a vertical section and top view, respectively, of a recorder acting parallel with the recording-surface and employing this invention. Figs. 13 to 16, inclusive, are views in vertical section of other forms of the recorder adapted to carry out the invention, and Fig. 17 is a vertical section of a slightly-different reproducer from that shown in Fig. 10.

The sinuous line A, Fig. 1, represents the recorded wave-line heretofore produced in phonographs for vowel sounds. It will be observed that the waves have the greatest depth at the center of their length, and that they rise symmetrically in each direction from the central point. The sinuous line B, Fig. 2, is a similar representation of the wave-line for hissing sounds and on the same scale. It will be seen that these waves also have their greatest depth at their centers, but that they are longer and have less depth than the waves for vowel sounds, and hence are much more gradual. Since the loudness of the sounds produced by the phonograph-reproducer depends upon the sharpness of the impulses, it is evident that these hissing sounds will be very feeble. In fact, in many cases they are not audible at all, and words depending on them for their characteristics are not reproduced with clearness of articulation.

Now it will be seen that if the form of the waves in recording is changed, so as to transfer the point of greatest depth from the center to near the end of each wave, the impulse produced by the recorded waves in the passing of the reproducing-point over them will

be greatly sharpened. The lines C and D, Figs. 3 and 4, represent recorded waves of this modified character and such as are produced by the employment of this invention.

The difference in the action of the gradual and abrupt waves I suppose to be explained by the application of the simple laws of dynamics. In Fig. 5, which shows a pure wave-record, the reproducing-point *a* is lifted the distance *y z* while the recording-surface is traveling the distance *x z*. In Fig. 6, which shows a modified or sharpened wave-record, the reproducing-point is lifted the same distance, *y z*, while the recording-surface is traveling the shorter distance, *x' z*. Assuming the same rate of travel for the recording-surfaces, the distance *x' z* being one-half of *x z*, it will be seen that in the second case double the energy will be exerted in lifting the recording-point the same distance, and hence, without increasing the depth of the waves, the sound effects are increased.

To modify the recorded waves and make them different in form from the sound-waves producing the record by making them abrupt at one end, I control the relations between the recording-point and the recording-surface. I find that by giving the parts such a relation that the reciprocating movements of the indenting-point are oblique to the line of movement of the recording-surface, rather than substantially perpendicular to it, the proper effect is produced, the greater the degree of obliquity the more abrupt being the recorded waves, the greatest depth of each wave being moved nearer to the end of the wave. This may be done in a variety of ways by fixing the location of the pivot of the lever carrying the indenting-point and by changing the angular position of the recorder.

In Fig. 7 the recording-surface E is represented as a revolving cylinder. The recorder-diaphragm is shown at F. The recording-point *b* is connected with the center of the diaphragm, and is mounted on a lever, *c*, pivoted at the point *c'*. This lever is short and its pivot is located above the indenting-point, considering the recording-point as acting on the top of the recording-surface. The direction of movement of the indenting-point is represented by the line *d*. It will be seen that as the point moves forward into the recording-surface it will advance against the movement of the surface and the effect will be a prolongation of the first part of the recorded wave, while when the point retracts it will move with the surface and the effect will be to shorten and make abrupt the second part of the recorded wave. If the lever *c* were pivoted at *c''*, the movement of the indenting-point would be as represented by line *d'*. If the pivot were at *c'''*, the movement of the point would be represented by line *d''*. Either of these two latter movements of the indenting-point would be substantially perpendicular to the recording-surface and the desired modifi-

cation of the wave-record would not be produced. The point-carrying lever should be short and have its pivot within the edge of the diaphragm, and the pivots should also be
 5 above the point to secure the proper results, or the equivalent of these conditions should be secured. The shorter the lever and the farther the distance of the pivot above the point the more oblique will be the movement
 10 of the point. The proper conditions can be obtained by advancing in either of these directions—i. e., if the pivot is put a sufficient distance above the point, the lever may be longer and may extend beyond the diaphragm,
 15 while if the lever is made exceedingly short the distance of the pivot above the point may be greatly lessened. The effect of bringing the pivot into the same plane as the point is shown in Fig. 7 by the line d^2 and in Fig. 8
 20 by the line e' . In Fig. 8 the same arrangement is illustrated as in Fig. 7, with the exception that a flat recording-surface, G, is shown instead of the cylinder. The line of movement of the recording-point is shown at
 25 e , while if the pivot of the lever should be located at the recording-surface at the point marked by a cross the line of movement of the recording-point would be, as at e' , substantially perpendicular to the recording-surface, and hence not effective for the purposes
 30 of my invention. By changing the angular position of the diaphragm with relation to the recording-surface a long lever carrying the indenting-point can be employed, as shown in
 35 Fig. 9; but this is obviously equivalent to placing the pivot farther above the point, as shown by the dotted lines in this figure.

The reproducer, Fig. 10, may be a fine wire point, f , connected with the diaphragm H by
 40 a solid block of india-rubber, g . The reproducing-point is bent downwardly into an inclined position, and is adapted to follow the records produced by the recorders of Figs. 7, 8, and 9.

45 In Figs. 11 and 12 is illustrated the use of the invention with recorders having points reciprocating in the plane of the recording-surface, instead of in a plane perpendicular to such surface.

50 In Fig. 13 the recording-point h is pivoted to the center of the diaphragm. A rigid arm, i , projecting from the ring or frame of the recorder, rests at its end against the beveled side of the recording-point, which is held
 55 against the arm by a spring, i' . This arrangement, it will be seen, will give the recording-point a movement oblique to the recording-surface. In Fig. 14 the same object is accomplished by connecting the rigid arm with
 60 the indenting-point by a pin and oblique slot.

In Fig. 15 the recording-point k is mounted upon the carrying-lever k' , between the pivot of the lever and its connection with the diaphragm.

65 In Fig. 16 the recording-point l is pivoted

on the diaphragm and has a tail-piece, l' , which rests on a rigid arm, m , against which it is held by a spring, m' .

In Fig. 17 the reproducer, instead of having for its point a spring-wire, as in Fig. 10, has
 70 such point formed on the end of a pivoted lever, n , thrown forward by a spring, o , which keeps the diaphragm under tension. The lever n is connected with the center of the diaphragm by a solid block, p , of india-rub-
 75 ber, cork, or other suitable material.

The improvement in the art hereinbefore explained removes the element of uncertainty which has heretofore existed in the construction of phonographs, and enables successful
 80 phonographs to be made of an endless variety in design and differing widely in detail, which has not heretofore been possible, since the correct principle of construction has not before
 85 been known.

What I claim is—

1. The improvement in the art of recording sounds for reproduction, consisting in impressing a suitable recording-surface with waves corresponding with the sound-waves,
 90 but made abrupt at one end, substantially as set forth.

2. The improvement in the art of recording sounds for reproduction, consisting in impressing a suitable recording-surface with
 95 waves corresponding with the sound-waves, but made abrupt at the last end of the waves, substantially as set forth.

3. The improvement in the art of recording sounds for reproduction, consisting in vibrating an indenting-point correspondingly with
 100 the sound-waves, but oblique to the relative line of movement of the recording-surface, whereby the recorded waves will be more abrupt at one end than at the other, substan-
 105 tially as set forth.

4. The improvement in the art of recording sounds for reproduction, consisting in vibrating an indenting-point correspondingly with
 110 the sound-waves, but oblique to the relative line of movement of the recording-surface, the oblique movement being such that the indenting-point moves forward against the movement of the recording-surface and backward with such movement, whereby the re-
 115 corded waves will be more abrupt at their end than at their beginning, substantially as set forth.

5. The improvement in the art of reproducing sounds, which consists in the employment
 120 of actuating-waves that are more abrupt at one end than at the other, substantially as set forth.

This specification signed and witnessed this 14th day of July, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
 A. W. KIDDLE.

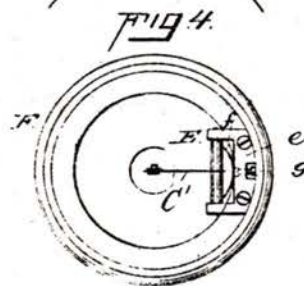
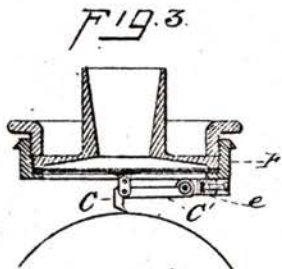
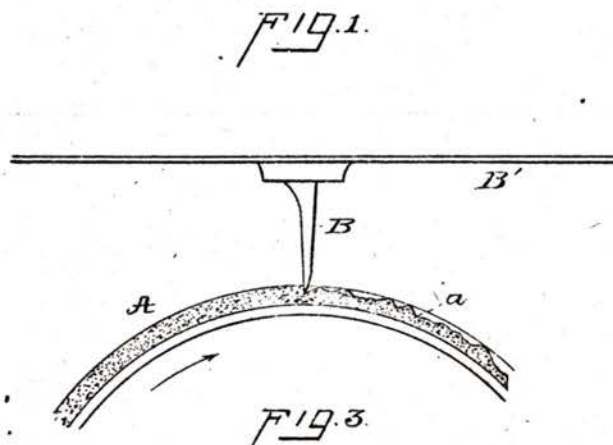
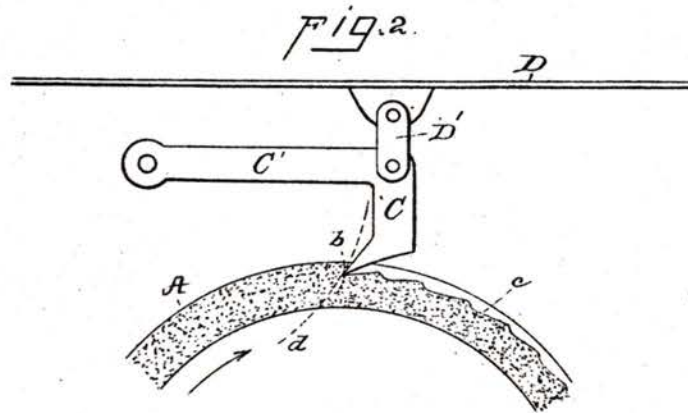
(No Model.)

T. A. EDISON.

METHOD OF RECORDING AND REPRODUCING SOUNDS.

No. 393,967.

Patented Dec. 4, 1888.



WITNESSES:

E. Rowland.
William Rye.

INVENTOR,

Thomas A. Edison.
 BY *Dyer & Seely*
 ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

METHOD OF RECORDING AND REPRODUCING SOUNDS.

SPECIFICATION forming part of Letters Patent No. 393,967, dated December 4, 1888.

Application filed July 17, 1888. Serial No. 280,209. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 791,) of which the following is a specification.

For the recording-surface of my phonograph, (i. e., the phonogram-blank) I employ a solid material, such as a wax composition or a mixture of metallic soaps capable of being indented by the recording-point. In recording sounds a groove is formed in the material by means of an indenting-point connected with the diaphragm of the recorder, and this groove varies in depth accordingly as the indenting-point is advanced or withdrawn by the vibrations of the diaphragm, thus forming the wave-record from which the sounds are reproduced, as is well understood.

Heretofore the recording-point used has been constructed so that in forming the groove it removed the material by a scraping action. This was due to the fact that the advancing edge of the recording-style used was perpendicular to the recording-surface or receded from the perpendicular, the result being a scraping rather than a true cutting of the material. The scraping action I have found to be productive of false vibrations, which become a part of the record, and which are audible as scratching and other foreign noises when the sounds are reproduced. I have found that this difficulty is overcome by employing a recording-point made as a true cutting-tool with a cutting-edge in advance of the stock of the tool. It might be supposed that a cutting-tool would be unsuitable for the recording-point, and that the heel of the tool would strike the bottom of the groove and prevent the formation of a perfect record, or obliterate the record as made by smoothing or pressing out the indentations more or less; but I have found that the movement of the recording-surface is sufficient to keep the heel of the tool clear of the indentations. This adaptability of the cutting-tool form for the recording-point I consider is also due in a measure to the fact that the recording-point in my phonograph is arranged to act more or less obliquely to the recording-surface, so that

the recorded waves will begin gradually and end abruptly. This oblique movement may be accomplished in any of the ways described in my application No. 786, (Serial No. 280,204, filed July 17, 1888,) in which this particular matter is more fully explained. The recording-point in its forward movement advancing against the movement of the recording-surface, the cutting-tool will clear itself just to the extent that its movement advances from the perpendicular, and thus the speed of the recording-surface will be supplemented in the respect of serving to keep the heel of the tool clear by the oblique movement of the cutting-tool. The waves, being abrupt, need not be as deep, and hence there is less difficulty in clearing the tool.

In my phonograph the cutting-tool recording-point is carried by a lever which takes the lateral thrust of the tool and relieves the diaphragm of the strain due to that thrust. This carrying-lever is also pivoted so as to produce the oblique movement of the recording-point before referred to. It also is made light, is provided with friction-bearings to overcome the momentum of the diaphragm and attached parts and to take up lost motion, and it is also positively connected with the diaphragm by a pivoted link or other form of connection which will yield in the direction of the length of the lever, so as to prevent the straining of the diaphragm. While I prefer to employ these several details, yet it is evident that the cutting-tool can be used with phonograph-recorders of various constructions, and hence I do not wish that feature of my invention, except when specially indicated by the claims, to be limited to the details stated. The cutting of the record in the material of the recording-surface, instead of scraping it, makes a clean smooth record, free from imperfections, producing scratching or other foreign noises in the reproducer.

In the accompanying drawings, forming a part hereof, Figure 1 is a view, on an exaggerated scale, illustrating the formation of a record by a scraping-style, as heretofore. Fig. 2 is a similar view illustrating the use of this invention. Fig. 3 is a vertical section of my phonograph-recorder complete, and Fig. 4 is a bottom view of the recorder.

A is the recording-surface, which may be

considered as a wax composition capable of being indented by the recording point or style. It is given a movement in the direction of the arrows, Figs. 1 and 2.

- 5 Heretofore the recording-style B has had its advancing edge perpendicular to the recording-surface or receding from it, as shown in Fig. 1. This produced the record *a* by a scraping action. By my invention the recording-point C, Fig. 2, is a cutting-tool having a cutting-edge, *b*, in advance of the stock of the tool. This produces the record *c* by a true cutting action. The style B is attached directly and only to the diaphragm B', and hence the wave record *a* is composed of waves having a symmetrical rise and fall with the deepest part of each wave at its center. The point C is mounted on a pivoted lever, C', connected with the diaphragm D by a pivoted link, D'. The direction of movement of the cutting-edge of the recording-point C is described by the dotted circle *d*; hence it will be seen that the recording-point C acts obliquely to the recording-surface and produces recorded waves, which begin gradually and end abruptly. It will be seen that such is the character of the wave-record *c*. By the movement of the recording-surface and the oblique action of the recording-point the heel of the cutting-tool, forming the recording-point, is kept clear in operation.

- From the description that has already been given and an inspection of Figs. 3 and 4 it will be readily understood how my phonograph-recorder is constructed. The lever C' is carried by a bearing-pin, E, which is pivoted in a yoke, *e*, secured to the annular frame F of the recorder. A spring, *f*, bears against the pin E, and is adjusted in its tension by a screw, *g*. This produces a friction at the bearings of the pin E, which overcomes the momentum of the diaphragm and attached

parts by retarding their movement, and also takes up all lost motion at the bearings. The spring-friction produces a non-resilient and constantly-acting retarding device. The pivoted link D' prevents the diaphragm from being strained by the differences in movement of the diaphragm and the recording-point by reason of the fact that the link, due to its pivots, yields in the direction of the length of the carrier-lever, while it forms a positive connection between the recording-point and the diaphragm.

I do not claim in this application the machine or apparatus herein described, but only the method of operation, I having been required by the Commissioner of Patents to embody the apparatus in a separate application for Letters Patent.

What I claim is—

1. The method of recording sounds for reproduction, consisting in impressing sound-vibrations upon a cutting recording-point and thereby cutting in the recording-surface the record corresponding to the sound-waves in contradistinction to the formation of such sound-records by a scraping action.

2. The method of recording sounds for reproduction, consisting in impressing sound-vibrations upon a cutting recording-point, and directing the vibrations of such recording-point obliquely to the recording-surface and thereby cutting in the recording-surface a sound-wave record having waves more abrupt at one end than at the other in contradistinction to the formation of such sound-records by a scraping action.

This specification signed and witnessed this 14th day of July, 1888.

THOS. A. EDISON.

Witnesses:

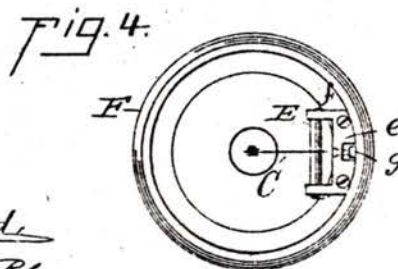
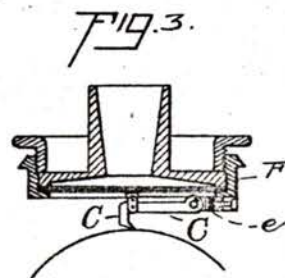
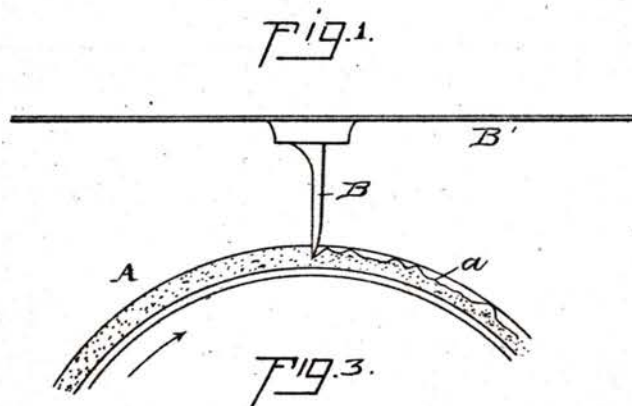
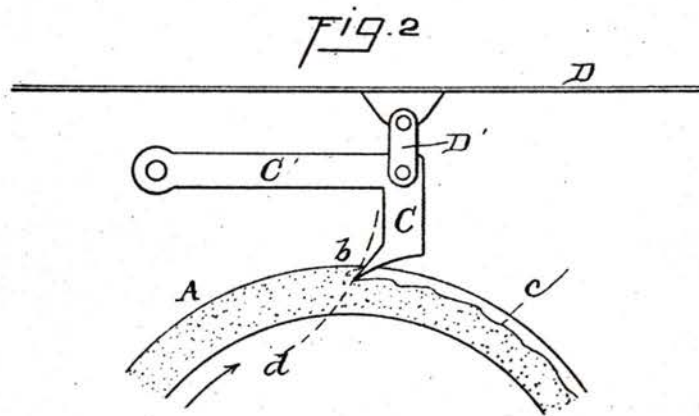
WILLIAM PELZER,
A. W. KIDDLE.

(No Model.)

T. A. EDISON.
PHONOGRAPH RECORDER.

No. 393,968.

Patented Dec. 4, 1888.



WITNESSES:
E. B. Rowland
William R. Rye

INVENTOR,
Thomas A. Edison
BY *John S. ...*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH-RECORDER.

SPECIFICATION forming part of Letters Patent No. 393,968, dated December 4, 1888.

Original application filed July 17, 1888, Serial No. 280,209. Divided and this application filed November 5, 1888. Serial No. 290,023. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 813,) of which the following is a specification.

In my application filed July 17, 1888, Serial No. 280,209, of which this application is a division, is set forth a method of recording sound-vibrations by cutting the record in the recording-surface as distinguished from impressing such record by a scraping action, and also an apparatus for carrying such invention into effect. In that application the method only is claimed, the Commissioner of Patents having required me to embody the apparatus in a separate application.

For the recording-surface of my phonograph (*i. e.*, the phonogram-blank) I employ a solid material—such as a wax composition or a mixture of metallic soaps capable of being indented by the recording-point. In recording sounds a groove is formed in the material by means of an indenting-point connected with the diaphragm of the recorder, and this groove varies in depth accordingly as the indenting-point is advanced or withdrawn by the vibrations of the diaphragm, thus forming the wave-record from which the sounds are reproduced, as is well understood.

Heretofore the recording-point used has been constructed so that in forming the groove it removed the material by a scraping action. This was due to the fact that the advancing edge of the recording-style used was perpendicular to the recording-surface or receded from the perpendicular, the result being a scraping rather than a true cutting of the material. The scraping action I have found to be productive of false vibrations, which become a part of the record, and which are audible as scratching and other foreign noises when the sounds are reproduced. I have found that this difficulty is overcome by employing a recording-point made as a true cutting-tool with a cutting-edge in advance of the stock of the tool. It might be supposed that a cutting-tool would be unsuitable for the recording-point and that the heel of the tool

would strike the bottom of the groove and prevent the formation of a perfect record, or obliterate the record as made by smoothing or pressing out the indentations more or less; but I have found that the movement of the recording-surface is sufficient to keep the heel of the tool clear of the indentations. This adaptability of the cutting-tool form for the recording-point I consider is also due in a measure to the fact that the recording-point in my phonograph is arranged to act more or less obliquely to the recording-surface, so that the recorded waves will begin gradually and end abruptly. This oblique movement may be accomplished in any of the ways described in my application No. 786, (Serial No. 280,204,) in which this particular matter is more fully explained. The recording-point in its forward movement advancing against the movement of the recording-surface, the cutting-tool will clear itself just to the extent that its movement advances from the perpendicular, and thus the speed of the recording-surface will be supplemented in the respect of serving to keep the heel of the tool clear by the oblique movement of the cutting-tool. The waves, being abrupt, need not be as deep, and hence there is less difficulty in clearing the tool.

In my phonograph the cutting-tool recording-point is carried by a lever, which takes the lateral thrust of the tool and relieves the diaphragm of the strain due to that thrust. This carrying-lever is also pivoted so as to produce the oblique movement of the recording-point, before referred to. It also is made light, is provided with friction-bearings to overcome the momentum of the diaphragm and attached parts and to take up lost motion, and it is also positively connected with the diaphragm by a pivoted link or other form of connection which will yield in the direction of the length of the lever, so as to prevent the straining of the diaphragm.

While I prefer to employ these several details, yet it is evident that the cutting-tool can be used with phonograph-recorders of various constructions, and hence I do not wish that feature of my invention, except when specially indicated by the claims, to be limited to the details stated. The cutting of the record in the material of the recording-surface

instead of scraping it makes a clean smooth record free from imperfections producing scratching or other foreign noises in the reproducer.

- 5 In the accompanying drawings, forming a part hereof, Figure 1 is a view, on an exaggerated scale, illustrating the formation of a record by a scraping-style as heretofore. Fig. 2 is a similar view illustrating the use of this invention. Fig. 3 is a vertical section of my phonograph-recorder complete, and Fig. 4 is a bottom view of the recorder.

A is the recording-surface, which may be considered as a wax composition capable of being indented by the recording point or style. It is given a movement in the direction of the arrows, Figs. 1 and 2.

Heretofore the recording-style B has had its advancing edge perpendicular to the recording-surface or receding from it, as shown in Fig. 1. This produced the record *a* by a scraping action. By my invention the recording-point C, Fig. 2, is a cutting-tool having a cutting-edge, *b*, in advance of the stock of the tool. This produces the record *c* by a true cutting action. The style B is attached directly and only to the diaphragm B', and hence the wave-record *a* is composed of waves having a symmetrical rise and fall with the deepest part of each wave at its center. The point C is mounted on a pivoted lever, C', connected with the diaphragm D by a pivoted link, D'. The direction of movement of the cutting-edge of the recording-point C is described by the dotted circle *d*; hence it will be seen that the recording-point C acts obliquely to the recording-surface and produces recorded waves which begin gradually and end abruptly. It will be seen that such is the character of the wave-record *c*. By the movement of the recording-surface and the oblique action of the recording-point the heel of the cutting-tool, forming the recording-point, is kept clear in operation.

- 45 From the description that has already been given and an inspection of Figs. 3 and 4 it will be readily understood how my phonograph-recorder is constructed. The lever C' is carried by a bearing-pin, E, which is piv-

oted in a yoke, *e*, secured to the annular frame F of the recorder. A spring, *f*, bears against the pin E, and is adjusted in its tension by a screw, *g*. This produces a friction at the bearings of the pin E, which overcomes the momentum of the diaphragm and attached parts by retarding their movement, and also takes up all lost motion at the bearings. The spring-friction produces a non-resilient and constantly-acting retarding device. The pivoted link D' prevents the diaphragm from being strained by the differences in movement of the diaphragm and the recording-point by reason of the fact that the link, due to its pivots, yields in the direction of the length of the carrier-lever, while it forms a positive connection between the recording-point and the diaphragm.

What I claim is—

1. A phonograph-recorder having for its recording-point a cutting-tool with a cutting-edge in advance of the stock of the tool, substantially as set forth.
2. In a phonograph-recorder, the combination, with the diaphragm, of a cutting-tool recording-point connected with the diaphragm and mounted to move obliquely to the recording-surface, substantially as set forth.
3. In a phonograph-recorder, the combination, with the diaphragm, of a cutting-tool recording-point connected with the diaphragm, and a non-resilient constantly-acting retarding device for retarding the movement of such point in both directions, substantially as set forth.
4. In a phonograph-recorder, the combination, with the diaphragm, of a cutting-tool recording-point connected with the diaphragm, a lever carrying such point, and a positive connection between the point and the diaphragm, which connection is constructed to yield in the direction of the length of the lever, substantially as set forth.

This specification signed and witnessed this 31st day of October, 1888.

THOMAS A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

(Model.)

No. 394,105.

Fig. 1.

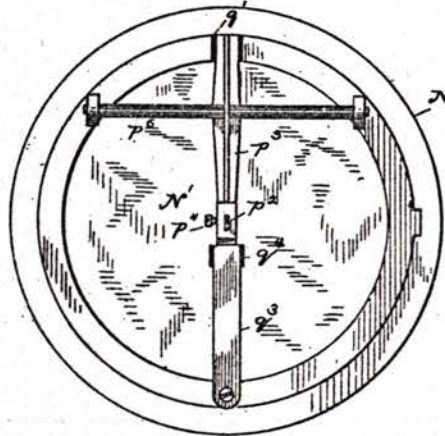
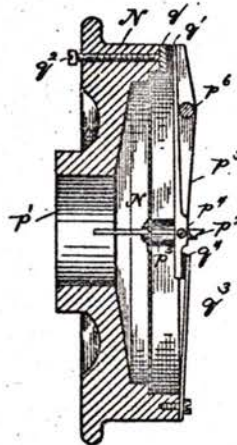


Fig. 2.



Witnesses.
E. L. Cowland,
William Ayer.

Thomas A. Edison.
Inventor.
By his Attorneys
Ogden & Lusk.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO
THE EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAPH-RECORDER.

SPECIFICATION forming part of Letters Patent No. 394,105, dated December 4, 1888.

Original application filed November 26, 1887, Serial No. 256,189. Divided and this application filed March 2, 1888. Serial No. 265,887. (Model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Recorders, (Case No. 760, division of Case No. 741,) of which the following is a specification.

The object I have in view is to produce an efficient recording instrument for phonographs; and my invention consists in the several novel features and combinations, as fully hereinafter explained, and pointed out by the claims.

In the accompanying drawings, forming a part hereof, Figure 1 is a bottom or rear view of the recorder on an enlarged scale, and Fig. 2 a sectional view of the same.

N is a metal plate forming the body of the recorder. It has an opening, p' , passing centrally through it, to which the speaking-tube of the phonograph is applied. The back of the plate N is recessed to form a circular chamber, on a shoulder in which is placed the diaphragm N' , which is preferably made of celluloid or some other light material, and is placed in the recess at the back of the plate N, but is left free at its edges. The recording-point p^2 is secured to the center of the diaphragm by wax or in any other suitable way. This point is constructed of a thin plate of steel, which is cut or ground to a point on one edge, and is beveled backwardly away from that edge, so as to give a support for the indenting-point and prevent vibration of that point in operation. This point passes through the end of the lever p^3 , and is secured therein by a set-screw, p^4 , the point being surrounded between the lever and the diaphragm by a small tube, p^5 , of rubber or other suitable material. The lever p^3 is rigid in its construction, and is mounted upon a cross-pin, p^6 , of considerable length, which is journaled at its ends at the sides of the plate N. The lever p^3 extends beyond the pivoting-pin p^6 , and rests at its outer end against a block, q , which is faced with a piece of pure india-rubber, q' . This block is set in a recess in the edge of the plate N, and is adjusted forward by a screw, q^2 . The adjustable block q and its elastic face

q' form a yielding limiting-stop for the movement of the indenting-point. The other end of the lever p^3 extends beyond the indenting-point p^2 , and receives inward pressure from a spring, q^3 , which is secured to the rim of the plate N, opposite to the block q , and presses the lever p^3 and the indenting-point inwardly, so as to give the center of the diaphragm a slight inward bend, producing an initial strain upon the diaphragm. Between the end of the spring q^3 and the lever p^3 a piece of india-rubber, q^4 , is placed. The lever p^3 , being rigid in its construction and in its support by the long bearing, prevents any vibration of the indenting-point, while the adjustable limit-stop formed by the block q and rubber q' limits the movement of the diaphragm to a small compass.

This construction of recorder I have found exceedingly effective in use. The diaphragm is highly sensitive and responds accurately to speech-vibrations. The movement of the indenting-point is quite free within exceedingly small limits, but the resistance to its movement increases enormously as the extent of the movement is increased; hence the importance of the fundamental tones in the operation of the instrument is reduced, while the hissing tones, which produce movements of a small extent, are given an undue importance in the record. This makes the reproduced sound clear and intelligible, since the hissing sounds are brought out clearly and can be distinguished from the scraping noises of the instrument.

It will be observed that the diaphragm is under constant tension, and can have no movement at all except that which is permitted by the elasticity of the yielding limit-stop q' . Heretofore the diaphragm of the phonograph-recorder and the indenting-point have not been limited in their forward movement except by the capacity of the diaphragm for vibration. This has permitted strong waves, owing to great momentum and the small amount of energy stored up as a retracting force, to give abnormal and untruthful vibrations to the diaphragm. With my present recorder the diaphragm does not force the lever forward into space, but compresses

matter always in contact—viz., the rubber q' ; hence nearly all the work is stored up in the compression of q' to effect the return movement, and the momentum becoming a small factor compared to the power stored up, the diaphragm is not given untruthful vibrations. This principle of construction of the recorder I have termed a "closed" or "constrained" system of movement as distinguished from the open or free system of movement heretofore employed.

What I claim is—

1. A phonograph-recorder having, in combination, a diaphragm, an indenting-point secured to the center of said diaphragm, a rigid lever and spring acting to force the point back against the diaphragm, and a yielding limit-stop limiting the outward movement of the diaphragm, substantially as set forth.

2. A phonograph-recorder having, in combination, a diaphragm, an indenting-point moved by such diaphragm, and a limiting-stop limiting the outward movement of the diaphragm and indenting-point, substantially as set forth.

3. A phonograph-recorder having, in combination, a diaphragm, an indenting-point moved by such diaphragm, and a yielding limiting-stop limiting the outward movement of the diaphragm and indenting-point, substantially as set forth.

4. A phonograph-recorder having, in combination, a diaphragm, an indenting-point moved by such diaphragm, and an adjustable limiting-stop limiting the outward movement of the diaphragm and indenting-point, substantially as set forth.

5. A phonograph-recorder having, in combination, a diaphragm with free edges, an indenting-point secured to the center of the diaphragm, a rigidly-constructed pivoted lever connected with said indenting-point at one end and resting against an adjustable yielding limit-stop at the other end, and a spring pressing the lever inwardly, so as to put the diaphragm under an initial strain, substantially as set forth.

6. A phonograph-recorder having, in combination, a diaphragm, an indenting-point moved by the diaphragm, a rigidly-constructed lever carrying such indenting-point, and a long pivotal bearing for such lever, substantially as set forth.

This specification signed and witnessed this 20th day of February, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

1188

(Model.) .

T. A. EDISON.
PHONOGRAPH REPRODUCER.

No. 394,106.

Patented Dec. 4, 1888.

Fig. 1.

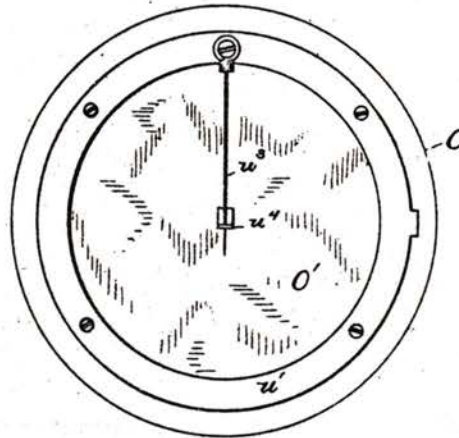
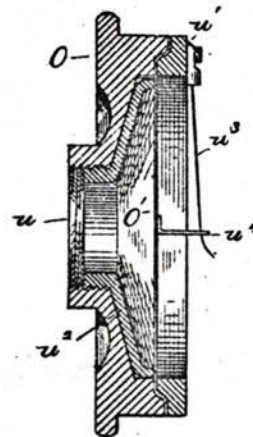


Fig. 2.



Witnesses.
E. L. Rowland
William Ager

Inventor.
Thomas A. Edison.
By his Attorneys *Dyer & Lecky.*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO
THE EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAPH-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 394,106, dated December 4, 1888.

Original application filed November 26, 1887, Serial No. 256,189. Divided and this application filed March 2, 1888. Serial No. 265,888. (Model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Reproducers, (Case No. 761, division of Case No. 741,) of which the following is a specification.

The object I have in view is to produce an efficient reproducing-instrument for phonographs; and my invention consists in the several novel features and combinations, as fully hereinafter explained, and pointed out by the claims.

In the accompanying drawings, forming a part hereof, Figure 1 is a bottom or rear view of the reproducer on an enlarged scale, and Fig. 2 a sectional view of the same.

O is a metal plate forming the body of the reproducer. It has an opening, u , passing centrally through it, to which the listening-tube of the phonograph is applied. The plate O is recessed at its back, and has stretched across it a diaphragm, O' , which is preferably a thin animal membrane. This diaphragm is secured in place by a ring, u' , which is secured to the back of the plate O, while the diaphragm is stretched by another ring, u^2 , which has a neck screwing into the opening u of the plate, and is capable of being turned by a tool, so as to stretch the diaphragm O' more or less. To one edge of the ring u' is secured a fine spring-wire, u^3 , which is long enough to reach from the point where it is secured to the center of the diaphragm, and has its inner end turned downwardly, as shown, to follow the spiral line of indentations upon the phonogram. The inner end of this spring-wire u^3 is attached to the center of the diaphragm by a strip, u^4 , of rubber. The tendency of the spring-wire is to bend away from the diaphragm, so that it strains the small rubber strip u^4 and places the diaphragm under an initial tension. The movement of the point of the wire u^3 in reproducing is so slight that the strain is

never wholly removed from the rubber strip u^4 , and hence the diaphragm is always under tension, which tends to draw it outwardly at the center. This makes the instrument exceedingly sensitive and capable of reproducing sounds accurately. The end of the wire u^3 being rounded and burnished, it will not obliterate the phonogram-record, even though that record is made in quite soft material.

I have found that by connecting the reproducing-point with the diaphragm by a strip of elastic material—such as rubber held under tension—the proper wave motion is transmitted to the diaphragm, but the scratching noises which seem to require molecular transmission are largely obliterated.

What I claim is—

1. A phonograph-reproducer having, in combination, a diaphragm and a reproducing-point connected with the diaphragm by a strained elastic strip, substantially as set forth.

2. A phonograph-reproducer having, in combination, a diaphragm and reproducing-point, a spring tending to throw the reproducing-point away from the diaphragm, and an elastic strip connecting the point with the diaphragm, whereby a spring-tension will always exist between the point and the diaphragm, substantially as set forth.

3. A phonograph-reproducer having, in combination, a diaphragm and a spring-wire secured at its outer end and projecting toward the center of the diaphragm and turned to form a reproducing-point, said spring-wire tending to spring away from the diaphragm, and a strip of india-rubber connecting the end of the spring-wire to the center of the diaphragm, substantially as set forth.

4. A phonograph-reproducer having, in combination, a diaphragm of animal membrane, a reproducing-point, a spring tending to throw the reproducing-point away from the diaphragm, and an elastic strip connecting said point with the center of the diaphragm, substantially as set forth.

5. A phonograph - reproducer having, in combination, a diaphragm of animal membrane, a ring for stretching such diaphragm, a reproducing - point, a spring tending to throw the reproducing-point away from the diaphragm, and an elastic strip connecting said reproducing-point with the diaphragm, substantially as set forth.

This specification signed and witnessed this 20th day of February, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

(No Model.)

T. A. EDISON.

PHONOGRAPH RECORDER AND REPRODUCER.

No. 397,280.

Patented Feb. 5, 1889.

FIG. 1.

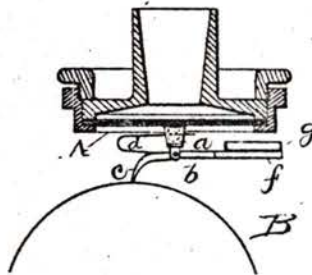


FIG. 2.

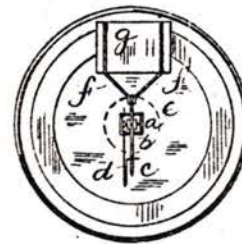


FIG. 3.

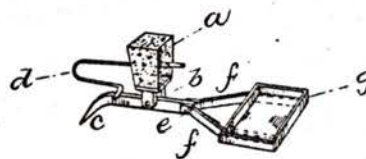


FIG. 4.

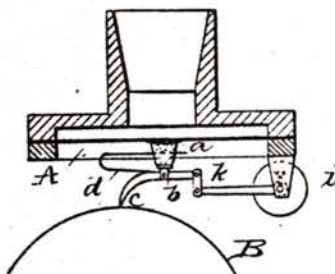


FIG. 5.

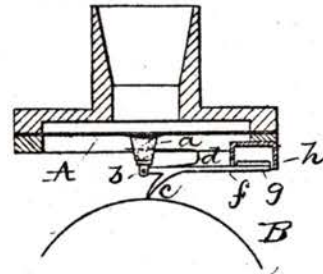


FIG. 7.

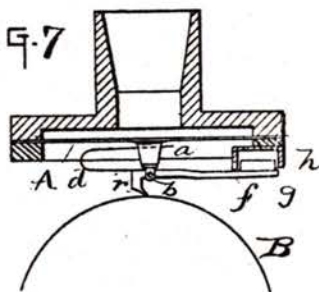


FIG. 4.

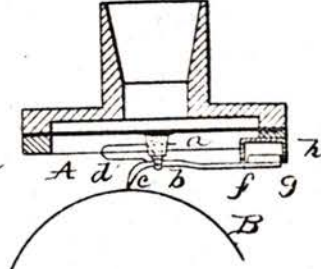
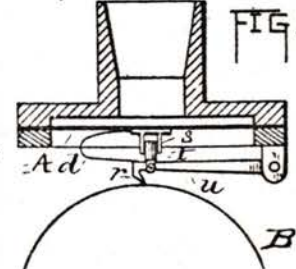


FIG. 8.



Witnesses:
 E. C. Rowland
 William R. Roper

Inventor
 Thomas A. Edison
 By his Attorneys
 J. S. Lacey

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH RECORDER AND REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 397,280, dated February 5, 1889.

Application filed September 27, 1888. Serial No. 286,552. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 804,) of which the following is a specification.

My invention relates to the recording and reproducing devices of the phonograph; and my object is to enable such devices to work independently of irregularities in the surface of the phonogram. Sometimes in the manufacture of phonogram-cylinders irregularities or eccentricities occur in the formation of the surface, and sometimes the cylinders become warped after manufacture, and if provision is not made to prevent it such irregularities will occasion oscillations of the reproducing-point and the diaphragm, which will interfere with the recording or reproducing of the sound. This is obviated by my invention, which consists, mainly, in so supporting the recording or the reproducing point that it is capable of movement independently of the diaphragm, but that such independent movement is retarded so that it does not occur with the rapid and minute vibrations of the sound-record, but only with the slower and more extensive vibrations which are produced by irregularities in the shape of the phonogram. The sound-vibrations have to-and-fro movements of great rapidity and large number per second, and these cannot move the retarding device, so that the same acts as though it were fixed, and all the energy due to the sound-waves or the sound-record is communicated directly from the diaphragm to the recording-point or from the reproducing-point to the diaphragm, while the movements given to such points by eccentricities of the phonogram, being long and slow, overcome the tendency to inaction of the retarding device, and so permit the movement independent of the diaphragm. This makes it possible to record on or reproduce from a very irregular revolving phonogram—even one which is oval in shape.

In carrying my invention into effect I support the recording or reproducing point pivotally, and I attach to such point a retarding device, which is preferably a fan or piston, the inertia and retardation of which retard-

ing device are such that it will not be moved by the sound-vibrations, but will be moved by the slower movements referred to, so that the latter are not communicated to the diaphragm; but under the quick sound-vibrations the connection of the reproducing-point to the diaphragm is practically a rigid one. Instead of a fan I may employ a weight, preferably in the form of a wheel; but the fan or piston is found to be preferable.

My invention is illustrated in the accompanying drawings.

Figures 1 to 6 illustrate reproducers. Fig. 1 is a cross-section of the ear-piece and side view of the reproducing-point and the devices connected therewith; Fig. 2, a top view of the reproducing-point and the retarding device; Fig. 3, a perspective view of the same. Fig. 4 shows a modified arrangement of the retarding device; Fig. 5, a different mode of pivoting the reproducing-point; and Fig. 6 illustrates the use of a wheel as a retarding device. Figs. 7 and 8 show recorders. Fig. 7 is a cross-section of the mouth-piece and side view of the recording-point and retarding device, and Fig. 8 shows in section another form of retarding device.

Referring first to Figs. 1 to 6, A represents the diaphragm, and B a portion of the surface of the cylinder containing the sound-record. A small cork, *a*, is attached to the center of the diaphragm, and from the cork project small lugs *b*, on which the reproducing-point *c* is pivoted. Lugs *b* extend from a plate which is secured to the end of the cork *a* by suitable cement—such as melted shellac—and the cork itself is similarly cemented to the diaphragm. A fine spring, *d*, is cemented in a slit in the cork and bears upon the reproducing-point, so as to hold the same against the phonogram. The arm which terminates in the reproducing-point extends back past the pivot, and has soldered to it at *e* two prongs of thin metal, *f*, to which is attached a piece of thin mica, *g*, which preferably has side ribs, so as to form a trough. This forms a fan or vane, and I have found that such a retarding device is practically rigid under the minute vibrations due to the sound-record, so that such vibrations are communicated directly through the cork *a* to the diaphragm; but when the reproducing-point passes over

any serious irregularity in the surface, such as would injure the reproduction of sound, the slow movement thus produced overcomes the inertia of the fan, and the reproducing-lever rocks on its pivot, being kept pressed against the surface by the spring, so that such an irregularity is taken up by the reproducing-arm itself and does not communicate motion to the diaphragm. The pressure of the spring is very light and merely counterbalances the weight of the fan, so as to overcome any tendency of the point to leave the surface. It will be seen that I connect the spring with the diaphragm. I do this to prevent any loss of motion through the spring. If it were connected to the rim, any movement or energy which might be communicated to it would pass to the rim and be lost; but where the spring is joined to the diaphragm any motion communicated to it is given to the diaphragm and aids the amplitude of vibration.

In the form shown in Fig. 4 I inclose the fan in a chamber, *h*, secured to the arm of the diaphragm, so as to increase the resistance to the motion of the fan.

In Fig. 5 the reproducing-lever is pivoted at its outer end to the cork on the diaphragm, and the spring projects from said cork and lies upon said lever.

In the form shown in Fig. 6 a small wheel, *i*, is supported in bearings below the rim of the diaphragm, and a link-connection is made at *k* between the reproducing-lever and the shaft of said wheel. In this case the weight of the wheel retards the movement of the lever on its pivot under the sound-vibrations in the same way as the fan in the other form; but under the slow motions of the irregularities in the cylinder the weight of the wheel is overcome, so that it turns and allows the lever to rock on its pivot. Any of these forms may be readily applied to recorders.

Fig. 7 shows an arrangement precisely like that of Fig. 5, *r* being the recording-point.

Fig. 8 shows a different arrangement, which is also applicable to reproducers. A small hollow cylinder or dash-pot, *s*, is attached to the center of the diaphragm, and in this works a plunger or piston, *t*, attached to lever *u*, which carries the recording-point *r*. The lever *u* is pivoted below the rim of the mouth-piece, and the fine spring attached at the center of the diaphragm bears at the free end of said lever. The rapid and minute sound-vibrations do not move the dash-pot upon the piston, (or vice versa in a reproducer;) but slow movements due to irregularities move the piston and so cause the desired movement of the point independent of the diaphragm.

It will be seen that in all these instances a retarding device is used whose inertia is such as will not be overcome by the normal quick motion of the recording or reproducing point; but will permit it to move under the slower motions due to defects in the cylinder-surface.

What I claim is—

1. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected therewith and capable of a retarded movement independent of the movement of the diaphragm, substantially as set forth.

2. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected with said diaphragm and capable of movement independent thereof, and provided with a retarding device for controlling such independent movement, substantially as set forth.

3. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point pivotally connected therewith, so as to have a movement independent thereof, and provided with a retarding device controlling such movement, substantially as set forth.

4. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected therewith and capable of a retarded movement independent of the diaphragm, and a spring for holding said point against the sound-record, substantially as set forth.

5. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point connected therewith and capable of a retarded movement independent of the diaphragm, and a spring connected with said diaphragm for holding said point against the sound-record, substantially as set forth.

6. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point pivotally connected therewith, a spring for holding said point against the sound-record, and a retarding device for controlling the movement of said point on its pivot, substantially as set forth.

7. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of the recording or reproducing point pivotally connected therewith, a spring connected with the diaphragm for holding said point against the sound-record, and a retarding device for controlling the movement of said point on its pivot, substantially as set forth.

8. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of a lever pivoted upon said diaphragm so as to have a movement independent thereof, and carrying the recording or reproducing point, and a retarding device connected with said lever, substantially as set forth.

9. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of a lever pivoted thereto and carrying the recording or reproducing point, and a fan attached to said lever, substantially as set forth.

10. In a recorder or reproducer for phonographs, the combination, with the diaphragm,

of the recording or reproducing point connected with said diaphragm and capable of movement independent thereof, and a fan or equivalent device for retarding such movement, substantially as set forth.

5 11. In a recorder or reproducer for phonographs, the combination, with the diaphragm, of a lever pivoted thereto and carrying the recording or reproducing point, a fan attached

to said lever, and a spring for holding said point against the sound-record, substantially as set forth.

This specification signed and witnessed this 19th day of September, 1888.

THOS. A. EDISON

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

1195

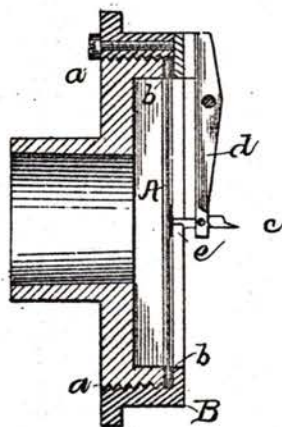
(No Model.)

T. A. EDISON.

PHONOGRAPH RECORDER AND REPRODUCER.

No. 400,646.

Patented Apr. 2, 1889.



WITNESSES:

Ed. J. G. Leland
W. D. Leland

INVENTOR.

Thomas A. Edison

BY

Dyer & Forey

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAPH RECORDER AND REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 400,646, dated April 2, 1889.

Application filed June 7, 1888. Serial No. 276,334. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Improvement in Phonograph Recorders and Reproducers, (Case No. 775,) of which the following is a specification.

The object I have in view is to produce a perfect diaphragm for the recorders and reproducers of phonographs, one which will
10 maintain its adjustment and give the maximum effects under varying conditions of heat and moisture due to atmospheric changes as well as to the breath of the operator in the case of a recorder.

I have found that by employing a film or membrane of glass or its equivalent porcelain as the diaphragm of the recorder or reproducer the difficulties heretofore encountered are effectively overcome. I preferably
20 employ microscope-glass, but other varieties of glass may be employed provided it is made thin as a film or membrane, so as to be capable of a sufficient amplitude of vibration to make or reproduce a proper record. I have
25 employed glass films or membranes for this purpose having a thickness of six one-thousandths to twelve one-thousandths part of an inch; but while the best results are obtained
30 with glass of extreme thinness, yet thicker glass has advantages over materials heretofore employed. The glass film is cut into a circular form of proper diameter by a diamond, and is clamped between metallic rings with
35 some yielding material—such as paper placed around the edges of the glass on both sides. The glass film or membrane diaphragm is not materially affected by ordinary variations of heat and moisture, it has great elasticity, and
40 is highly responsive to sound-vibrations, and is capable, by reason of its extreme thinness, of sufficient amplitude of vibration to make or reproduce a deep record. Hence it does not get out of adjustment, and gives at all
45 times the maximum effects, producing as a recorder a uniformly excellent record.

In the accompanying drawing, forming a part hereof, the figure represents a sectional view of a recorder embodying the invention.

A is the diaphragm of the recorder, which
50 is a film or membrane of glass or its equivalent for the purpose—porcelain. This diaphragm is held at its edges in the annular frame B by a screw-ring, *a*, rings of paper *b* being placed between the glass diaphragm
55 and the clamping-surfaces to hold the diaphragm firmly and prevent cracking.

The recording-point *c* is secured to a lever, *d*, and is attached to the center of the diaphragm by means of cement, *e*. The dia-
60 phragm is also equally applicable to phonograph-reproducers.

The glass or porcelain diaphragm I have found to have advantages over mica, which
65 has heretofore been used by me, since mica, by reason of its laminated structure, does not equal the glass in stiffness and elasticity.

It will be understood that when I refer herein to the diaphragm as of glass I mean to
70 include porcelain as an equivalent.

What I claim is—

1. In a phonograph, the recorder or reproducer having in combination with the recording or reproducing point a diaphragm of
75 glass, substantially as set forth.

2. In a phonograph, the recorder or reproducer having in combination with the recording or reproducing point a diaphragm of
80 microscope-glass, substantially as set forth.

3. In a phonograph, the recorder or reproducer having in combination with the recording or reproducing point a diaphragm of
85 glass clamped between metallic rings with rings of yielding material around the edges of the glass diaphragm, substantially as set forth.

4. In a phonograph, the recorder having in combination a glass diaphragm and a recording-point secured directly thereto by a suitable cement, substantially as set forth.

This specification signed and witnessed this
22d day of May, 1888.

THOS. A. EDISON

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

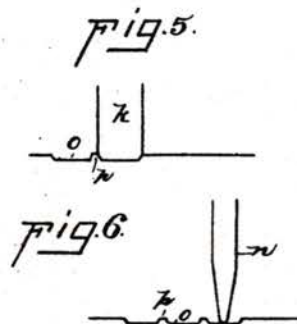
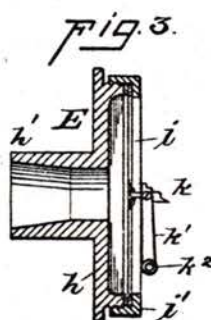
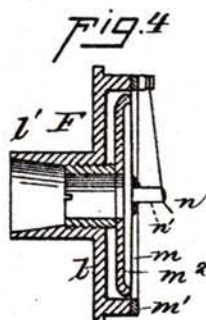
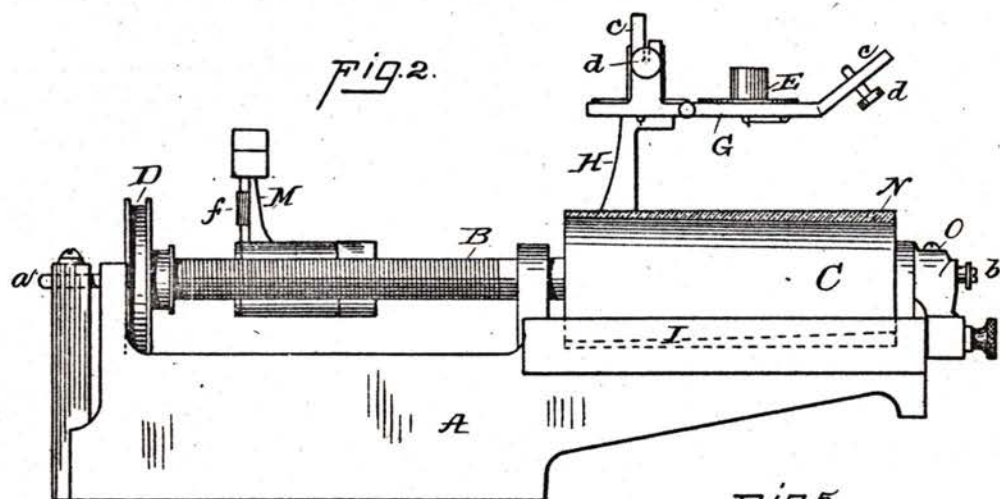
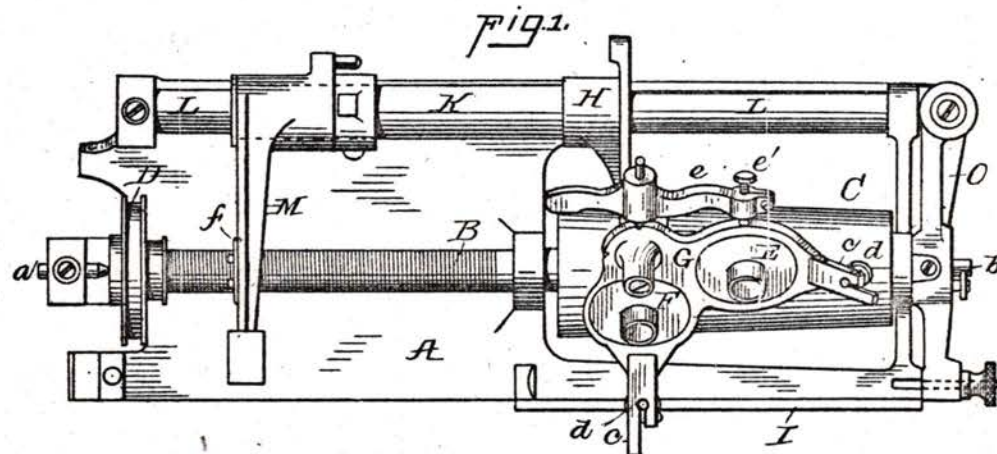
1197

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 400,647.

Patented Apr. 2, 1889.



Witnesses.
E. C. Rowland.
William F. Gurn

Inventor.
Thomas A. Edison
By his Attorneys Gurn & Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 400,647, dated April 2, 1889.

Application filed July 7, 1888. Serial No. 279,320. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 782,) of which the following is a specification.

I have found it desirable in my phonograph to use separate instruments for producing the record and for reproducing it, since if the reproduction of the sounds were made by the recording-instrument the record would soon be obliterated.

The object I have in view is to produce such a construction of phonograph that the reproducer can be readily adjusted to the record. This I accomplish by making the reproducing-point of less width than the recording-point, so that the reproducer will have a certain margin for adjustment, the sounds being reproduced if the point of the reproducer touches the bottom of the track of record at any point.

I prefer to mount the reproducer in the machine so that it can be adjusted laterally or across the track of the record, and I also prefer to provide each machine both with a recorder and a reproducer; but it is obvious that the elasticity of the reproducing-point may be depended upon to give a lateral adjustment, and it is further obvious that separate machines might be made for recording and reproducing.

The provision of means for permitting or securing the adjustment of the reproducing-point to the record is more especially made necessary by the employment of removable phonogram-blanks, which after the record is produced on them are removed from the machine and used for reproducing the sounds upon the same or another machine, since every record may require a different adjustment of the reproducer and so may the same record in removing the blank from the machine and again placing it in position thereon.

In the accompanying drawings, forming a part hereof, Figure 1 is a top view of a phonograph embodying my invention. Fig. 2 is an elevation of the same machine from the front,

showing the rocking holding-arm thrown back and the phonogram-blank in section. Figs. 3 and 4 are respectively sections of the recorder and reproducer; and Figs. 5 and 6 are exaggerated views of the points of the recorder and reproducer, respectively, showing the recording-surface in section.

A is the frame of the machine, upon which is mounted in centers *a b* a shaft, B, which carries on one end the phonogram-cylinder C, forming the carrier for the phonogram-blank. This phonogram-cylinder is preferably given a slight taper on its external surface, adapting it to receive and hold the removable phonogram-blank. The shaft B is provided with a wheel, D, through which the shaft is turned by connection with any suitable source of power, which may be an electric or spring motor or hand or foot movement.

E and F are the recorder and reproducer. These are held by a spectacle-frame, G, which is pivoted on the end of the rocking holding-arm H.

The recorder and reproducer, which will be presently described more in detail, are removably held in the eyes of the spectacle-frame and are adapted to be brought alternately into operative relation with the removable phonogram-blank by the swinging of such spectacle-frame to the right or to the left. Each eye of the spectacle-frame is provided with a finger, *c*, having a set-screw, *d*, therein, which set-screws rest alternately upon a guide-rest, I, which is mounted upon the frame of the machine in front of the phonogram-cylinder and parallel with its axis. The head of the rocking holding-arm has a laterally-extending arm, *e*, provided with an adjusting set-screw, *e'*. When the reproducer is swung into position, the eye of the spectacle-frame carrying it is limited in its movement by the set-screw *e'*, and by the adjustment of this set-screw the reproducing-point is adjusted laterally across the track of the record and is thereby brought into the best operative relation with the recording-surface. The rocking holding-arm is attached to a sleeve, K, which is mounted upon a stationary rod, L, supported upon the frame in the rear of the phonogram-cylinder and the shaft and parallel

therewith. At the other end of this sleeve K is a guide-arm, M, having a toothed block, f, on its free end, which engages with a fine screw-thread cut upon the shaft B between cylinder C and wheel D. This screw-thread feeds the recorder or reproducer lengthwise of the phonogram-cylinder while such cylinder is being turned through the medium of the shaft B and the power applied thereto. By throwing the rocking holding-arm back, as shown in Fig. 2, the phonogram-cylinder may continue to revolve without feeding the recorder or reproducer.

N is a cylindrical phonogram-blank, which is made of wax or other suitable material, and is preferably provided with a tapering bore, the taper being similar to that of the phonogram-cylinder, so that the blank can be pushed upon the cylinder and will hold itself by friction thereon, and can be readily removed therefrom, the center b being mounted on a swinging arm, O, to permit this to be done.

The recorder, Fig. 3, is composed of a plate, h, having a tube, h', rising therefrom, to which is connected the speaking-tube of the instrument. The diaphragm i is clamped between this plate and screw-ring i'. The recording-point k is carried by the lever k', which is secured to a long bearing-pin, k², mounted in bearings on the sides of the ring i'. The recording-point passes through the lever k' and is secured by cement to the center of the diaphragm.

The reproducer, Fig. 4, is composed of a plate, l, similar to plate h, and having a similar tube, l', to which the listening-tube of the machine is attached. The diaphragm m of the reproducer is held by the ring m', which is screwed to the plate l, and a stretching screw-ring, m², is provided for adjusting the tension of the diaphragm.

The reproducing-point n is a wire attached to the ring m' at one side and connected with the diaphragm by a block of rubber, n', the point of the wire being turned down to engage with the surface of the record. The recording-point is made from flat plate-steel with its side edges slightly filed away, as shown in the exaggerated view, Fig. 5, the thickness of the steel plate being in my present phonograph about one one-hundred-and-fiftieth part of an inch.

Since my apparatus is designed to make about one hundred threads of the record to the inch, the recording-point must be slightly narrower than one one-hundredth part of an inch, in order to leave a ridge between the tracks of the record.

The reproducing-point is finished by filing the end of the wire down to a point and then burnishing off the extreme point and buffing such point so as to leave a rounded point, which is approximately about half as wide as the recording-point or one three-hundredth part of an inch.

The tracks of record on the phonogram-blank are shown by o, while the ridges between such tracks are shown by p in Figs. 5 and 6. Now, it will be seen that if the reproducing-point touches the bottom of the track of record, whether at either side or at the center, since the entire bottom of the track contains the indentations from one side to the other, the reproducer will reproduce the sound. The reproducer thus has a certain margin of adjustment, which enables it to be readily adjusted into the track of record, the best point of adjustment being determined by the ear of the operator.

What I claim is—

1. A phonograph having a reproducing-point narrower than the indentations forming the sound-record, substantially as set forth.

2. The combination, in phonographs, of separate recording and reproducing instruments, the reproducing-point being narrower than the recording-point, substantially as set forth.

3. In a phonograph, the reproducer having its point narrower than the indentations forming the sound-record, in combination with means for adjusting such reproducer laterally across the track of the record, substantially as set forth.

4. In a phonograph, the reproducer having its point narrower than the indentations forming the sound-record, in combination with a phonogram-blank carrier adapted to receive a removable phonogram-blank, substantially as set forth.

5. In a phonograph, the reproducer having its point narrower than the indentations forming the sound-record, and means for adjusting such reproducer laterally across the track of the record, in combination with a phonogram-blank carrier adapted to receive a removable phonogram-blank, substantially as set forth.

This specification signed and witnessed this 30th day of June, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 400,648, dated April 2, 1889.

Application filed July 30, 1888. Serial No. 281,457. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Improvement in Phonogram-Blanks, (Case No. 796,) of which the following is a specification.

The object of my invention is to produce
10 phonogram blanks or bodies on which are to be produced a record of sound-vibrations, and which are to reproduce the same by the aid of the phonograph, which phonogram-blanks shall be composed of a material having superior qualities for receiving such record
15 and reproducing sound therefrom.

I have found that the various waxes are very desirable to use in the composition of such phonogram-blanks, but that most waxes if
20 used by themselves are too soft to be used for this purpose. I therefore mix with the wax a harder material, which will produce a harder compound.

I have found that stearic acid is an exceedingly desirable hardening material for this
25 purpose. I may mix this material with any suitable wax—such as ceresin, beeswax, or paraffine—but of these materials I prefer to use ceresin either alone or mixed with a small percentage of beeswax. I prefer the yellow
30 ceresin, because it is cheaper than white ceresin.

I have found the best mixture to be as follows: About one hundred parts, by weight, of ceresin, about twenty-five parts of beeswax, and about twenty-five parts of stearic acid. 35 The materials are simply melted together by heat and the melted compound is molded in suitable molds into the shape required for the phonogram-blanks, preferably into the form of hollow cylinders. 40

What I claim is—

1. Phonogram-blanks made of a mixture of a wax with stearic acid, substantially as set forth.

2. Phonogram-blanks made of a mixture of ceresin and stearic acid, substantially as set forth. 45

3. Phonogram-blanks made of a mixture of ceresin, beeswax, and stearic acid, substantially as set forth. 50

4. Phonogram-blanks made of a mixture of ceresin, beeswax, and stearic acid, in about the proportion, by weight, of one hundred parts of ceresin, twenty-five parts of beeswax, and twenty-five parts of stearic acid, substantially 55 as set forth.

This specification signed and witnessed this 27th day of July, 1888.

THOS. A. EDISON.

Witnesses:

RICHD. N. DYER,
WILLIAM PEIZER.

1201

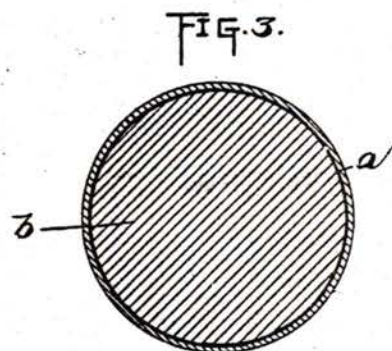
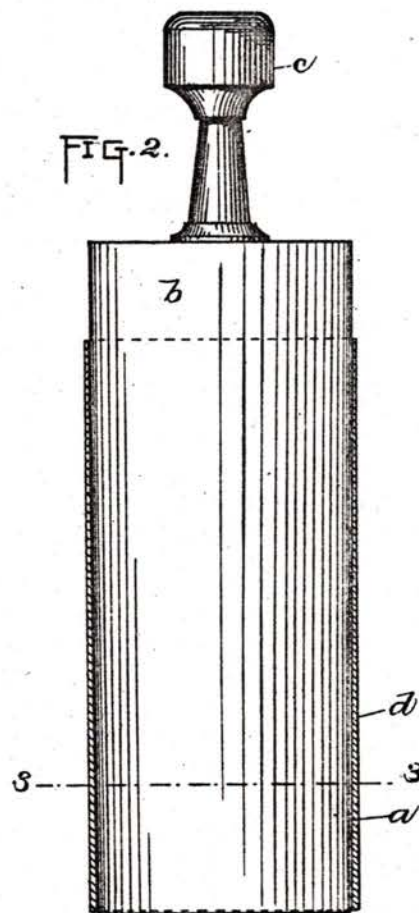
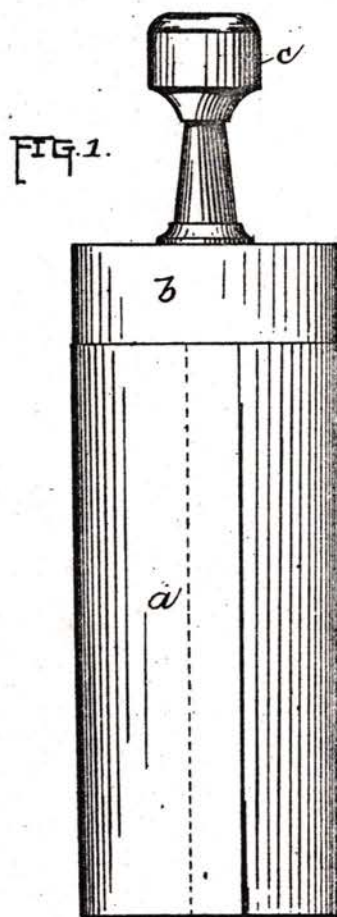
(No Model.)

T. A. EDISON.

METHOD OF MAKING PHONOGRAM BLANKS.

No. 400,649.

Patented Apr. 2, 1889.



WITNESSES:

E. Rowland.
William Rye

INVENTOR

Thomas A. Edison

BY

John S. ...

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

METHOD OF MAKING PHONOGRAM-BLANKS.

SPECIFICATION forming part of Letters Patent No. 400,649, dated April 2, 1889.

Application filed October 11, 1888. Serial No. 237,843. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Methods of Making Phonogram-Blanks, (Case No. 807,) of which the following is a specification.

The object of my invention is to produce, in a simple and expeditious manner, cylindrical phonogram-blanks made of paper or other flexible material covered with a material which can be indented by the recording-point of the phonograph.

In carrying my invention into effect, I first take a sheet of paper or other flexible material of the proper size, and I wrap this upon a tapering core which is provided with a handle. I secure the paper together at its edges, and I then, holding the core by the handle, dip it into a bath of the material to be applied to it while such material is in a softened condition. This material is preferably a wax or a composition of waxes or a suitable metallic soap. After the paper is dipped and becomes coated to a sufficient thickness with the indenting material, it is placed in a lathe, and its surface is turned off into a true cylindrical form, it being at first in the tapering form of the dipping-core. The phonogram-blank being then removed from the core is ready for use.

My invention is illustrated in the accompanying drawings.

Figure 1 is an elevation of the paper wrapped on the dipping-core; Fig. 2, a section of the same after dipping and turning, the core being in elevation; and Fig. 3, a cross-section on the line 3 3 of Fig. 2.

The sheet of paper *a* is wrapped upon the tapering cylindrical core *b*, which has a handle, *c*, and its overlapping edges are gummed or otherwise secured together. The paper thus assumes a form like that of the core. The core is then held by the handle and the paper dipped into the material, as above described, and this material *d* adheres to the surface of the paper, whereby a hollow cylinder tapering both inside and outside is produced. This is then turned off in a lathe into the shape shown in Fig. 2—that is, so that it has a cylindrical outer surface and a tapering bore, whereby on being removed from the forming-core it can readily be placed upon the cylinder of the phonograph and recorded upon.

In placing the cylinder in the lathe, I prefer to leave it on the forming-core, this being provided with depressions at its ends (shown in dotted lines) for holding it in the lathe.

What I claim is—

The method of making a phonogram-blank, which consists in wrapping a sheet of flexible material upon a tapering cylindrical core, dipping the same into the sound-recording material, which is caused to adhere to its surface, and then turning off the surface of such material into a true cylindrical form, substantially as set forth.

This specification signed and witnessed this 29th day of September, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

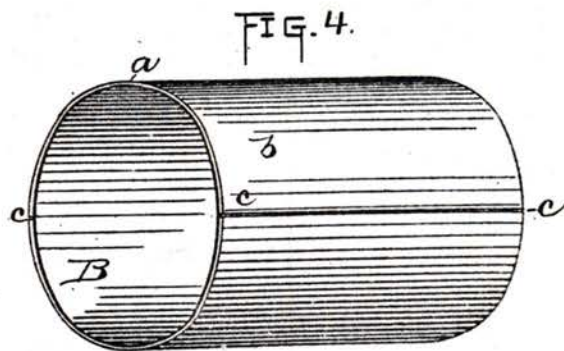
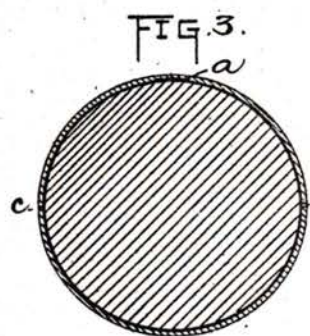
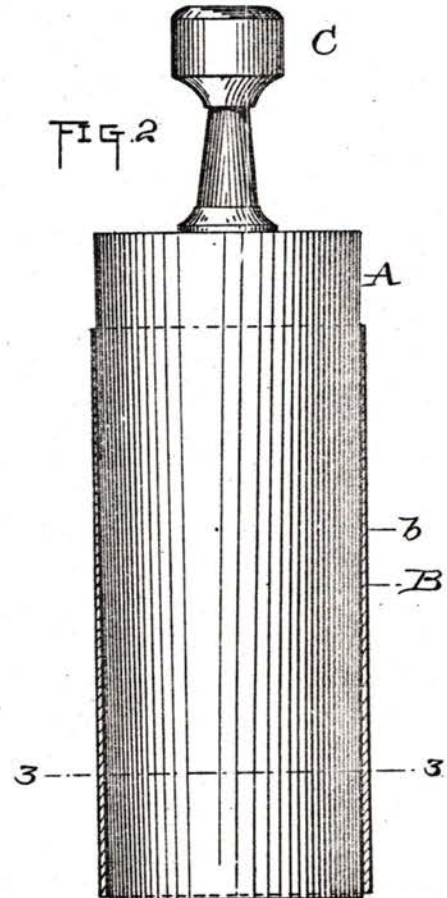
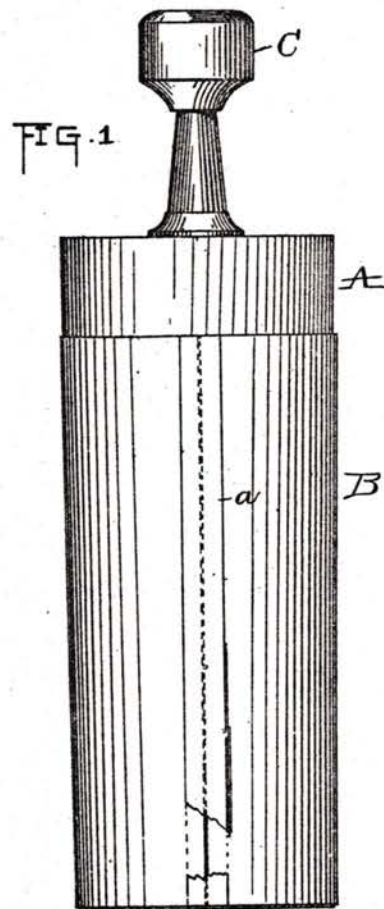
1203

(No Model.)

T. A. EDISON.
METHOD OF MAKING PHONOGRAM BLANKS.

No. 400,650.

Patented Apr. 2, 1889.



WITNESSES:
E. C. Rowland
William Rizer

INVENTOR,
Thomas A. Edison
BY *John H. ...*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

METHOD OF MAKING PHONOGRAM-BLANKS.

SPECIFICATION forming part of Letters Patent No. 400,650, dated April 2, 1889.

Application filed October 17, 1888. Serial No. 288,361. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex, in the State of New Jersey, have invented a certain new and useful Improvement in Methods of Making Phonogram-Blanks, (Case No. 809,) of which the following is a specification.

In my application filed September 19, 1888, Serial No. 285,794, is shown and described a collapsible phonogram-cylinder—that is, one which can be folded into a flat shape for transmittal by mail or otherwise.

My present invention relates to the method of making such collapsible phonogram-blanks.

In carrying my invention into effect I wrap a sheet of paper or other suitable flexible material upon a tapering cylindrical form or core, so that the edges of the paper meet, and I secure the said edges together by pasting a thin strip of tissue-paper upon the outside. I then dip the paper on the core into melted material, such as a wax, or a mixture of salts of fatty acids, such as oleate of lead and palmitate of magnesium. This material adheres to the surface of the paper and forms a coating which can be indented by the recording-point of the phonograph. This coating is turned off in a lathe, so that it has a true cylindrical surface, it being, after dipping, of a tapering shape corresponding to that of the core on which the paper is wrapped.

By means of a suitable tool or machine I then scrape the indenting material off the surface of the paper on two narrow lines directly opposite each other and extending the whole length of the cylinder. This forms points on which the cylinder can be collapsed or folded into a flat form, the paper forming an edge for folding. The use of the strip of tissue-paper for joining the edges, in place of overlapping the edges and securing them together, prevents any irregularity of the inner surface of the cylinder, and as the strip of tissue-paper is covered with the sound-recording material it does not affect the external surface of the phonogram-blank.

The above-described process is illustrated in the accompanying drawings.

Figure 1 shows the paper wrapped and secured upon the core, the view being in eleva-

tion. Fig. 2 shows the same after dipping in section. Fig. 3 is a cross-section of the core on the line 3 3 of Fig. 2, with the paper on it, after scraping off the material on two lines; and Fig. 4 is a perspective view of the complete phonogram-blank.

A is the tapering cylindrical core made of suitable metal, and B is the sheet of paper or other flexible material wrapped thereon and secured at its meeting edges by the thin strip of tissue-paper *a*, a portion of which is broken away in the drawings to show the edges of the paper.

In dipping the cylinder into the melted sound-recording material it is held by its handle C. After dipping and turning off the cylinder is as illustrated in Fig. 2—a paper having a coating, *b*, of the material, which receives the record, and having a tapering bore and a true cylindrical outer surface. Before or after removing the phonogram-blank from the core the material is scraped from the surface of the paper on two lines, *c c*, exactly opposite each other and extending the whole length of the cylinder. It will be seen that the cylinder can be folded together on these lines, and then forms a flat body suitable for inclosing in an ordinary envelope, and such body may readily be drawn out again into cylindrical shape and placed upon the cylinder of the phonograph, or upon a false shell placed on said cylinder.

What I claim is—

1. The method of making a collapsible phonogram-blank, which consists in folding flexible material into cylindrical form, covering the same with sound-recording material, and removing such material on two opposite lines, substantially as set forth.

2. The method of making a phonogram-blank, which consists in folding flexible material into cylindrical shape, with its edges meeting, securing such edges by a thin strip pasted on the outside of the cylinder, and covering said cylinder with sound-recording material, substantially as set forth.

3. The method of making a collapsible phonogram-blank, which consists in wrapping flexible material upon a core, securing it together at its edges, dipping it in sound-recording material, so that the same adheres to

its surface, and removing such material on two lines opposite each other, substantially as set forth.

- 5 4. The method of making a collapsible phonogram-blank, which consists in wrapping flexible material upon a tapering core, securing it together at its edges, dipping it into sound-recording material which adheres to its surface, turning off such material into cylin-

drical form, and removing such material on two lines opposite each other, substantially as set forth.

This specification signed and witnessed this 15th day of October, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

1206

(No Model.)

T. A. EDISON.
PHONOGRAM BLANK.

No. 414,759.

Patented Nov. 12, 1889.

FIG. 1.

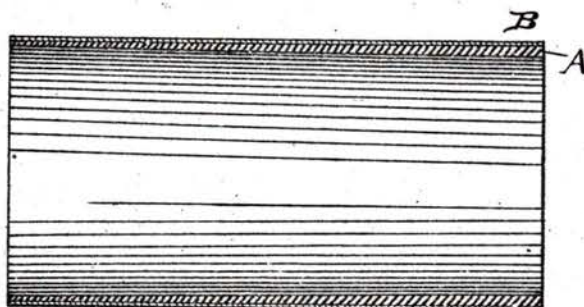
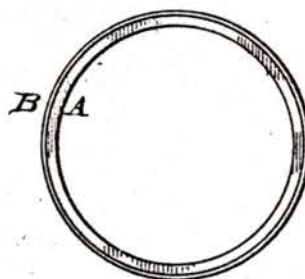


FIG. 2.



WITNESSES:

E. B. R. R. R.
W. R. R. R.

INVENTOR

Thomas A. Edison

BY

J. R. R. R.

ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS ALVA EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 414,759, dated November 12, 1889.

Application filed March 25, 1889. Serial No. 304,718. (No model.)

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Improvement in Phonogram-Blanks, (Case No. 830,) of which the following is a specification.

My invention relates to that character of phonogram-blanks which consist of a base or
10 backing of one material, usually a molded material, and an outer surface or covering of another material, which receives the sound-record.

In my application, Serial No. 300,514, filed
15 February 16, 1888, I have described a phonogram-blank of the character just referred to, which is designed to obviate some of the defects existing in other phonogram-blanks. In said application this is accomplished by
20 combining with the core or backing of the blank a recording-surface having the same or practically the same coefficient of expansion as the core or backing. Asphalts or bitumens for the core or backing and a coating
25 of metallic soap for the recording-surface are described as the preferable materials to produce the phonogram-blank of said application.

One object of my present invention is to
30 produce a strong, light, and economical core or backing for phonogram-blanks, over the surface of which a thin coating of material to be recorded is placed. This part of my invention consists in the use for the phonogram
35 core or backing of hard rubber or ebonite, consisting of rubber or allied gums combined with sulphur by heat. This core or backing is coated with a thin surface of a sound-recording material, and the blank thereby pro-
40 duced possesses great strength, is light and economical, and is capable of withstanding rough usage; hence musical or other phonographic records or duplicates made on it may be handled or shipped without danger of
45 breaking.

Another object of my invention is to provide the core or backing just referred to, which possesses great strength and abnormal expansion, with a material which shall have
50 the same or substantially the same coefficient of expansion. I have found that the stearates

of the metals possess practically the same coefficient of expansion as hard rubber or ebonite, and I propose to combine a stearate of a metal with a core or backing of hard rubber or ebonite to accomplish the object of this
55 part of my invention.

A third object of my invention is to equalize any variation in the coefficients of expansion of hard rubber or ebonite and the stearates
60 of the metals. This variation is likely to occur when different makes of hard rubber or ebonite are used, as this material when made by different manufacturers may have different coefficients of expansion. This I accom-
65 plish by combining with the stearate of a metal an oleate of a metal, by the use of more or less of which the coefficient of expansion of the stearate may be increased or dimin-
70 ished to correspond with the coefficient of expansion of the particular compound of hard rubber or ebonite used.

I prefer the phonogram-blank to be of the shape of a hollow cylinder with a tapering bore and a true cylindrical outer surface.
75 The backing or core for the blank may be made in any suitable manner or by molding singly in the usual manner of making vulcanized india-rubber articles; or a hollow cylinder of the hard rubber or vulcanite may be
80 made of length equal to a number of phonogram-blanks and subsequently cut to size and finished to form. The outer surface of the hard rubber or ebonite should be made rough to cause adherence of the recording-surface
85 to be applied to it. The outer coating, which is preferably a material having the same or substantially the same coefficient of expansion as a stearate of a metal, but which may be of any other suitable sound-recording material, is preferably applied by dipping the cylinder
90 into a bath of the melted material. When it is applied in this way, the surface may afterward be made true by turning it off in a suitable lathe after it has become cooled again.
95 Instead of this, however, the external material may be applied by molding, the cylinder being placed in a mold which is slightly larger than the cylinder and the covering material poured into such mold around the cylinder, so that it will adhere thereto and will form a smooth and true surface without the neces-
100

sity of turning it off. My experience has been, however, that the first-mentioned method is the less expensive.

When necessary, as above stated, an oleate of a metal may be added to the stearate in order to alter its expansion rate, the quantity varying according to the expansion rate required. For instance, if monostearate of soda is used the expansion may be increased by adding to it a small quantity of oleate of alumina. The proportion of the stearate and oleate used must be determined experimentally to suit the particular hard rubber or ebonite used.

The accompanying drawings illustrate a cylindrical phonogram-blank embodying my invention.

Figure 1 is a longitudinal section of the cylinder, and Fig. 2 an end view thereof.

A is the inner body or core, and B the outer surface of sound-recording material.

What I claim is—

1. A phonogram-blank composed of a base

of hard rubber or ebonite and an outer covering of sound-recording material, substantially as set forth.

2. A phonogram-blank composed of a base of hard rubber or ebonite and an outer recording-surface of different materials having the same or substantially the same coefficient of expansion, substantially as set forth.

3. A phonogram-blank composed of a base of hard rubber or ebonite and an outer recording-surface of a stearate of a metal, substantially as set forth.

4. A phonogram-blank composed of a base of hard rubber or ebonite and an outer covering composed of a stearate of a metal and an oleate of a metal, substantially as set forth.

This specification signed and witnessed this 22d day of March, 1889.

THOMAS ALVA EDISON.

Witnesses:

W. PELZER,

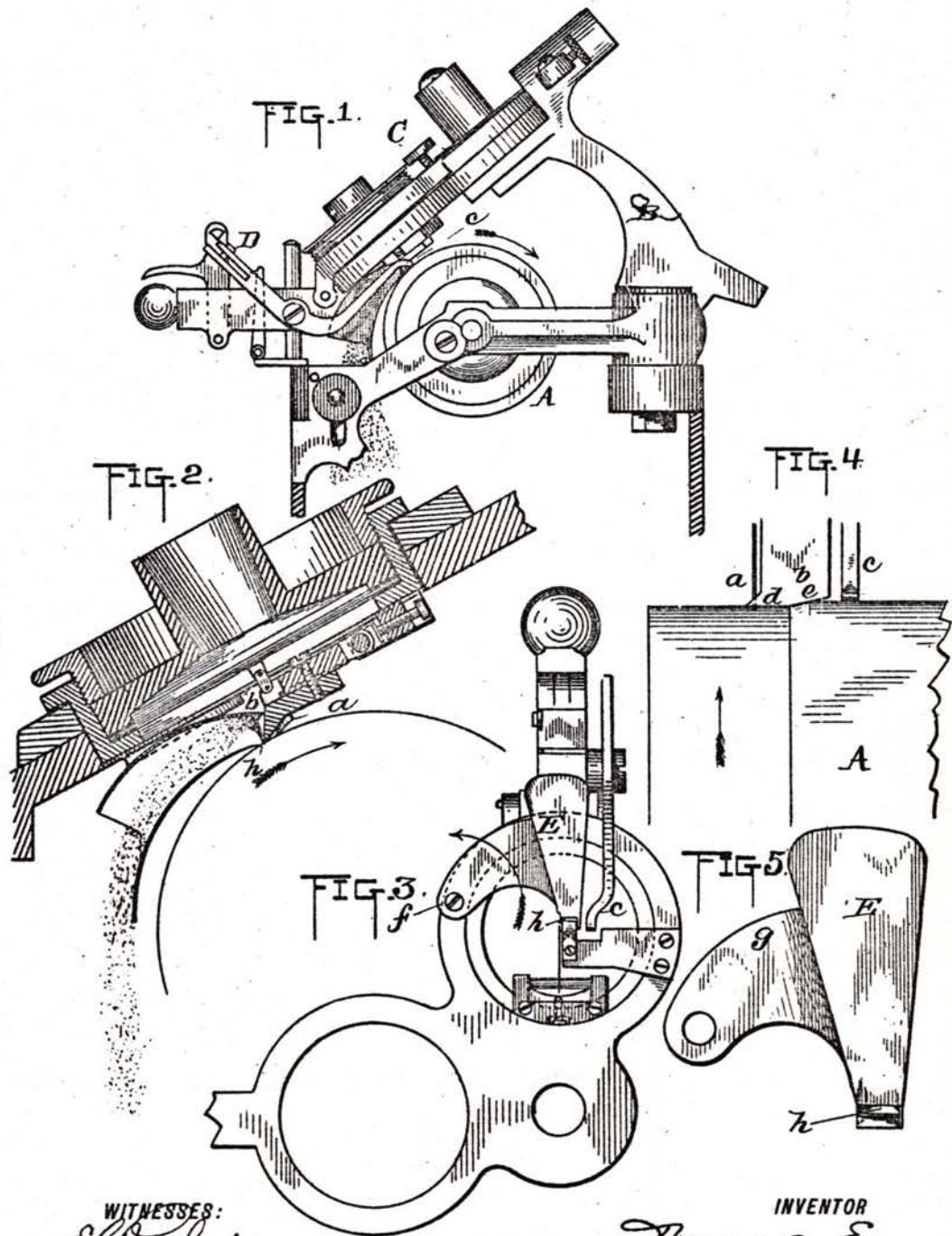
RICHD. N. DYER.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 414,760.

Patented Nov. 12, 1889.



WITNESSES:

E. A. Howland
W. P. Ryan

INVENTOR

Thomas A. Edison

BY

John P. ...

ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 414,760, dated November 12, 1889.

Application filed March 30, 1889. Serial No. 305,488. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 832,) of which the following is a specification.

In my phonograph I employ a cutting or turning-off tool acting on the surface of the cylindrical phonogram-blank for removing a former record and preparing the surface to receive a new record. One difficulty which has occurred in doing this is that of disposing of the chips or shavings which are removed by the cutting-tool and which I find become electrified, so that they fly in all directions, and sometimes clog the various parts of the apparatus.

The main object of my invention is to effectively avoid this difficulty; and to this end my invention consists partly in an improved form or construction for the cutting-tool, whereby it can cut only a very thin chip or shaving from the phonogram-blank, and partly in the arrangement of a chute or passage for receiving the material removed by the cutting-tool and conveying it to a receptacle provided for it.

My invention is illustrated in the accompanying drawings.

Figure 1 is an end view of a portion of the phonograph embodying my invention, showing the cylindrical phonogram-blank, the spectacle-frame which carries the recorder and reproducer, and the adjusting devices; Fig. 2, a vertical section of the recorder; Fig. 3, a bottom plan view of the same; Fig. 4, a view on an enlarged scale showing the position of the turning-off tool, and Fig. 5 a bottom view of the conveying-chute.

A is the cylindrical phonogram-blank, made of suitable material for receiving and reproducing the impressions of the sound-waves.

B is the rocking-arm which holds the spectacle-frame C and which carries the recorder and reproducer.

D is the automatic adjusting device set forth in my application, Serial No. 296,420, filed January 15, 1889, for automatically adjusting

the position of the recording-point relative to the surface of the phonogram-blank.

a is the recording-point, and b the turning-off tool traveling on the cylinder in advance of the recording-point, c being the determining-lever of the automatic adjustment. The turning-off tool or knife b is shaped at its end as shown in Fig. 4, having a straight cutting-edge at d and a beveled portion e. The cutting is done, as shown in Fig. 4, only by the straight edge d, the beveled portion e resting on the shoulder formed by the uncut portion of the cylinder and preventing the cutting-edge from entering the cylinder too deeply, whereby the knife can cut only a very thin shaving, just deep enough to entirely remove the traces of the previous record.

Secured to the rim of the recorder portion of the spectacle-frame by means of a screw f, passing through the end of the lug g, is a conveying-chute E. This consists of a curved box made of suitable metal or other material and carried in such position that its upper end is immediately in front of and in close proximity to the edge of the cutting-tool. The chute has a narrow opening h at its lower front edge, and above this opening the upper end of the chute overhangs the edge of the cutting-tool, so that the chip or shaving removed from the cylinder by such tool is necessarily projected upwardly through the opening h and into the chute, and it is conveyed by gravity into any suitable receptacle provided for it. The shaving striking the upper side of the chute is broken up into small particles, which particles are also unelectrified by the contact, so that they pass freely by gravity through the chute and fall into the place assigned for them.

What I claim is—

1. In a phonograph, the combination, with a cutting-knife acting on the phonogram-surface, of a conveying-chute in proximity thereto, substantially as set forth.

2. In a phonograph, the combination, with a cutting-knife acting on the phonogram-surface, of a conveying-chute having an opening opposite the cutting-edge and overhanging such edge, substantially as set forth.

3. In a phonograph, the combination, with

the spectacle-frame, of the recording-point and cutting-tool carried thereby, and a conveying-chute also carried by said frame in proximity to said cutting-tool, substantially as set forth.

4. In a phonograph, the cutting-tool having a straight cutting-edge and a beveled extension of such edge, substantially as set forth.

5. In a phonograph, the cutting-tool having

a straight cutting-edge and an extension of such edge in a different plane, substantially as set forth.

This specification signed and witnessed this 22d day of March, 1889.

THOS. A. EDISON.

Witnesses:

W. PELZER,

RICHD. N. DYER.

1212

(No Model.)

T. A. EDISON.
PHONOGRAM BLANK.

No. 414,761.

Patented Nov. 12, 1889.

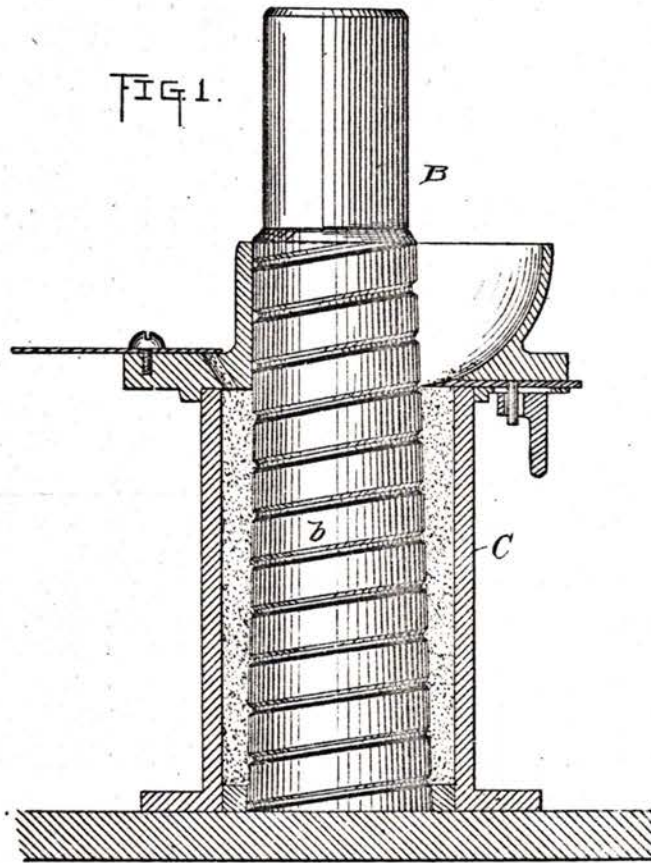
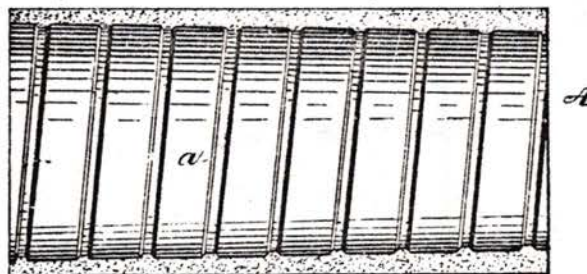


FIG 2.



Witnesses
E. A. Rowland
William C. Egan

Inventor
Thomas A. Edison
By *Attorneys* *J. S. [Signature]*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 414,761, dated November 12, 1889.

Application filed August 10, 1889. Serial No. 320,398. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonogram-Blanks, (Case No. 840,) of which the following is a specification.

My invention relates to cylindrical blanks for receiving sound-records in the phonograph, made of wax or wax-like or similar materials, and designed to be placed on the cylinder of the phonograph for receiving and reproducing the sound-record. Heretofore these cylinders have been made with a smooth inner surface fitting closely upon the cylinder of the phonograph. I have found that several advantages arise from providing the interior of the cylindrical phonogram-blank with ribs, flanges, or projections, and it is in this that my invention mainly consists. This construction makes it easier to remove the molded blank from the mold in which it is formed, enables the injurious effects of contraction or warping of the cylinder to be readily removed, and prevents any bad effect from the accumulation of dust on the cylinder of the phonograph. I prefer to form a spiral rib on the interior surface of the blank.

My invention is illustrated in the accompanying drawings.

Figure 1 is a view illustrating the process of molding the blank, the mold being shown in section; and Fig. 2 is a longitudinal section of the complete phonogram-blank embodying my invention.

Referring to Fig. 2, A is the cylindrical blank, having a tapering bore and a true cylindrical outer surface, and made of a suitable molded material capable of receiving impressions of the recording-point in the phonograph. On the interior of the cylinder is formed a spiral rib *a*. In making such a cylinder I prefer to employ a cylindrical tapering core B, on the surface of which is formed a spiral groove *b*, and which is placed in the mold C, of the kind described in my prior applications and patents, and the material for forming the blank is poured into the mold around the core, so that as it hardens it forms a cylindrical body having a tapering

bore and formed with a spiral rib on its inner surface. I find it easier to remove such a blank from the core than one having a smooth inner surface, since by slightly turning or screwing the same it can be readily withdrawn.

In the process of molding the blank while the material cools it sometimes becomes contracted or warped on its inner surface, so that it does not fit the phonogram-cylinder truly, and in this case it has to be reamed out to remove the irregularities. This has to be allowed for in making the blanks, and when the blank is made with a smooth interior the whole inner surface often has to be cut in order to make it true, and this is a matter of some difficulty and incurs a risk of injury to the blank. Where the blank is formed with an internal rib or ribs and such warping occurs, it is only necessary in order to remove it to cut away the edges of the ribs, and thus a blank having a true inner surface can be formed with less labor and expense and waste of material than where the smooth surface is used. I make the ribs always deep enough to allow for the reaming out of the cylinder. Another advantage is that when the blank is placed on the phonogram-cylinder any particles of dust or other foreign substance which may be on the cylinder enter and remain in the spaces between the ribs, instead of coming between the blank and the cylinder, where they might prevent the blank from assuming a true position and resting evenly thereon.

What I claim is—

1. A tubular phonogram-blank provided with internal ribs or projections, substantially as set forth.

2. A tubular phonogram-blank having an internal spiral rib, substantially as set forth.

3. A tubular phonogram-blank made of molded material and molded with ribs or projections on its inner surface, substantially as set forth.

This specification signed and witnessed this 16th day of July, 1889.

THOS. A. EDISON.

Witnesses:

D. H. DRISCOLL,
WILLIAM PELZER.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 430,274, dated June 17, 1890.

Application filed July 30, 1888, Serial No. 281,454. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
 5 new and useful Improvement in Phonogram-Blanks, (Case No. 793,) of which the following is a specification.

My invention relates to phonogram-blanks for receiving a record of sound-vibrations
 10 and reproducing the same; and my object is to produce blanks having superior qualities for recording and reproducing such vibrations.

To this end my invention consists, mainly,
 15 in making such blanks, which are preferably of cylindrical form, of soap of the character hereinafter described. Said material may be employed alone or mixed with other materials, such as waxes, resins, or gums.

20 Insoluble soap may be formed of any metal or sometimes of an earthy oxide, like lime, in combination with any fatty acid. For my purpose, however, it is best to use lead, magnesium, or aluminium, combined with oleic or
 25 stearic acid, forming an oleate or stearate of

the metal used. These compounds are preferred because of their superior amorphous quality. Of the metals named I especially prefer to employ lead, and especially to use
 30 a mixture of equal quantities of oleate and stearate of lead, the same being melted and poured into molds to form the cylindrical blanks.

The soap may be made according to the usual well-known methods.

What I claim is—

1. Phonogram-blanks made of metallic soap, substantially as set forth.

2. Phonogram-blanks made of lead soap, substantially as set forth.

3. Phonogram-blanks made of a mixture of
 40 oleate and stearate of lead, substantially as set forth.

This specification signed and witnessed this 14th day of July, 1888.

THOS. A. EDISON.

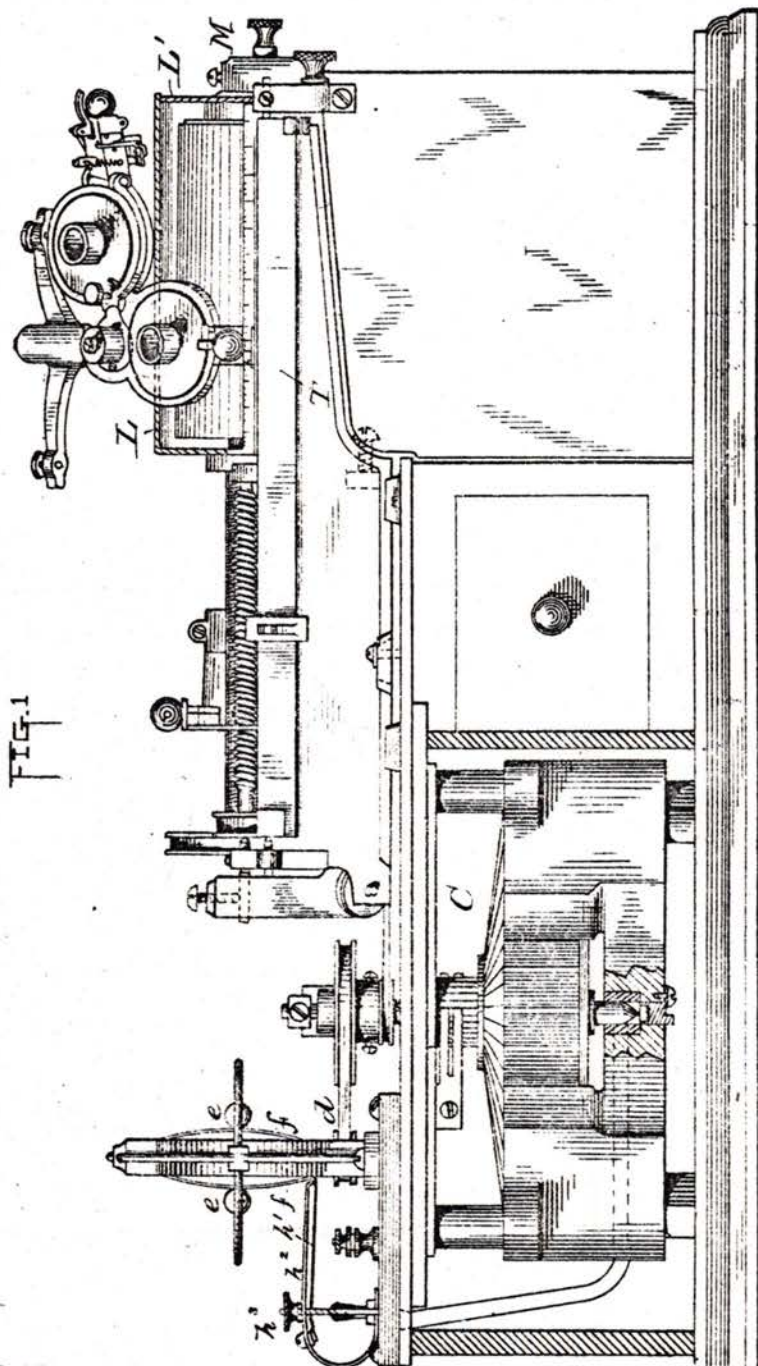
Witnesses:

WILLIAM PELZER,
 A. W. KIDDLE.

(No Model.)

4 Sheets—Sheet 1.

Patented June 17, 1890.



WITNESSES:

W. H. Rowland.
William Byer

INVENTOR

Thomas A. Edison

BY

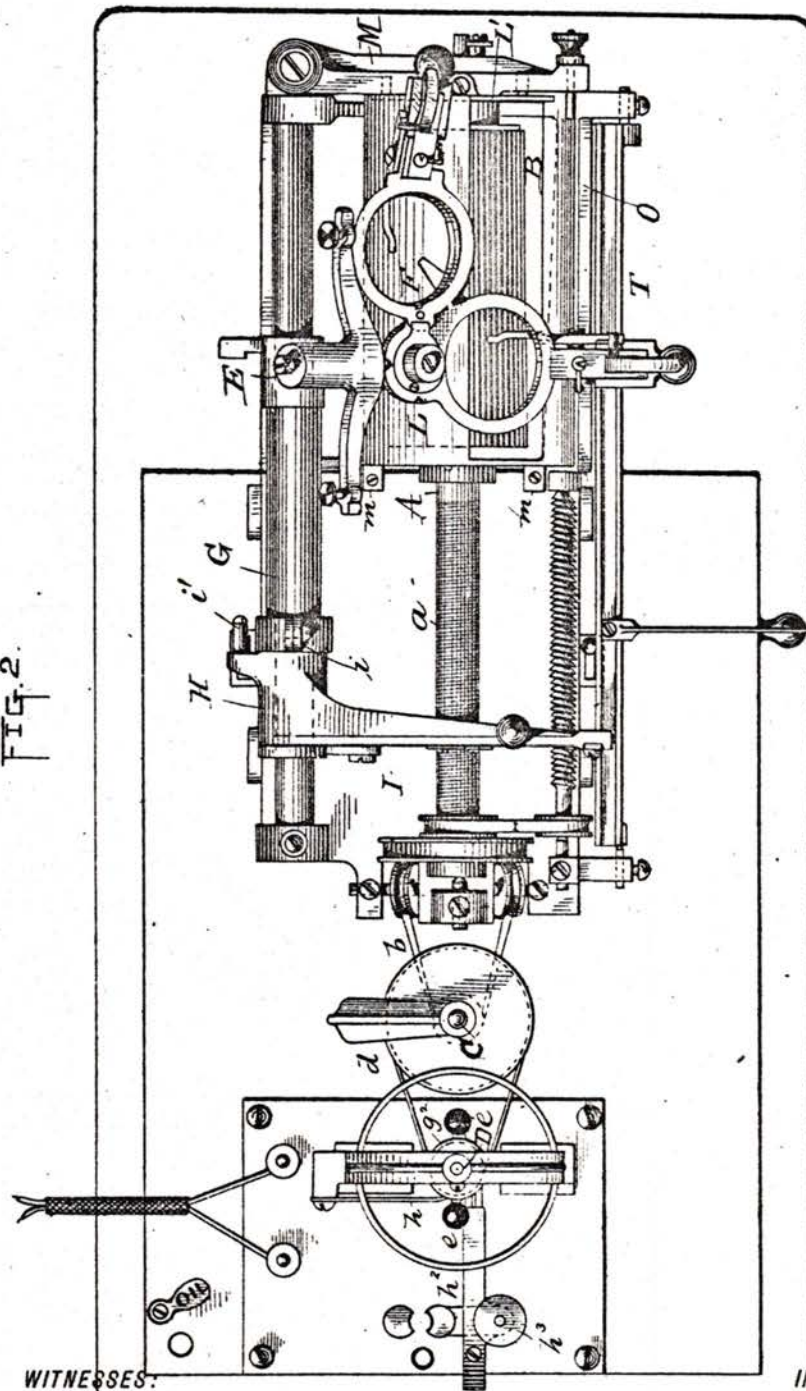
ATTORNEYS

T. A. EDISON.
PHONOGRAPH.

No. 430,276.

Patented June 17, 1890.

FIG. 2.



WITNESSES:

Ed. Rowland
William F. Ryan

INVENTOR

BY

Thomas A. Edison
John F. [Signature]
ATTORNEYS.

FIG. 4.

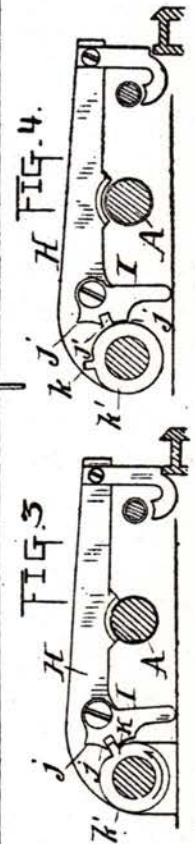
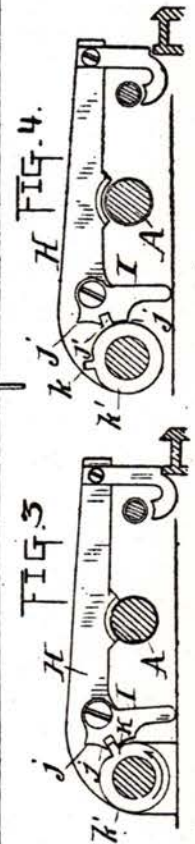


FIG. 3.



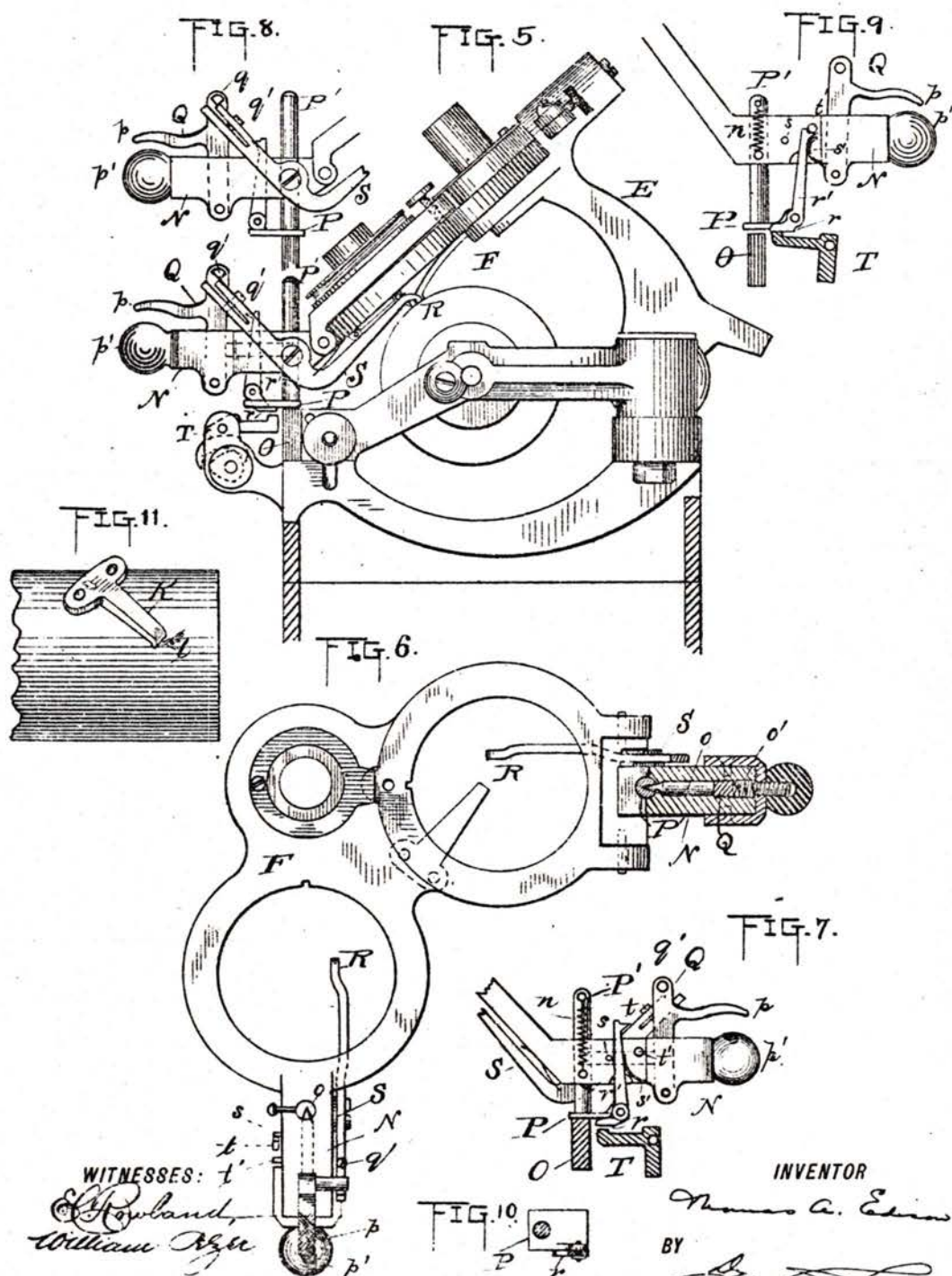
(No Model.)

4 Sheets—Sheet 3.

T. A. EDISON.
PHONOGRAPH.

No. 430,276.

Patented June 17, 1890.



(No Model.)

T. A. EDISON
PHONOGRAPH.

4 Sheets—Sheet 4.

No. 430,276.

Patented June 17, 1890.

FIG. 12.

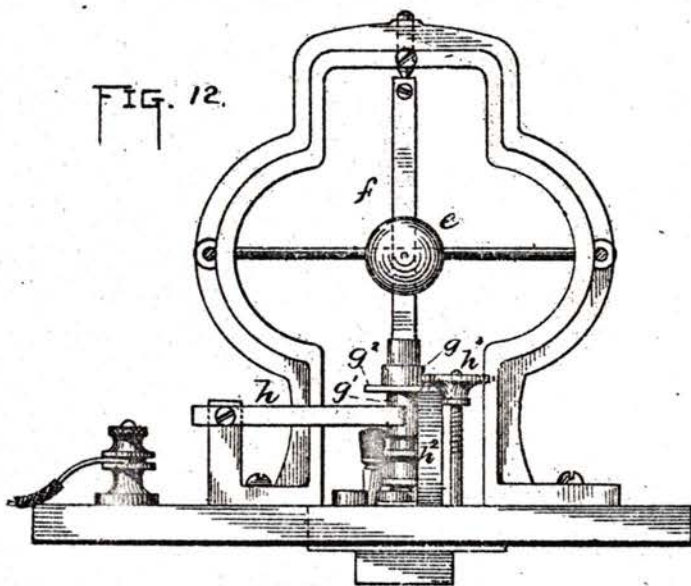
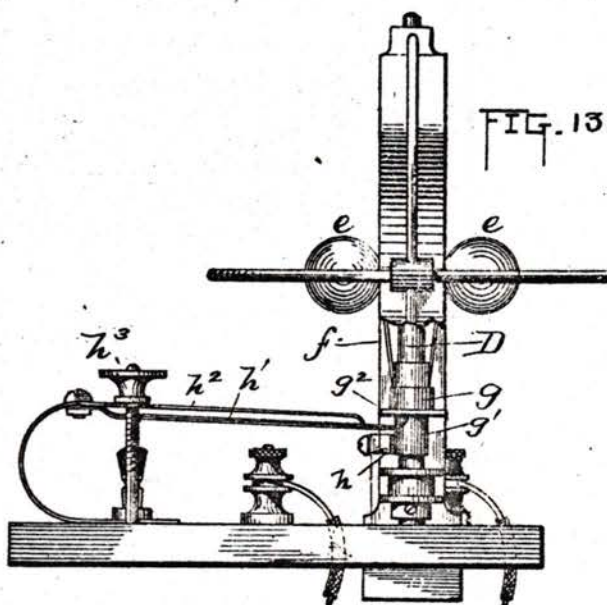


FIG. 13.



WITNESSES:
E. C. Roland
William R. Rye

INVENTOR
Thomas A. Edison
 BY *John H. ...*
 ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 430,276, dated June 17, 1890.

Application filed January 15, 1888. Serial No. 296,420. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 818,) of which the following is a specification.

My invention relates to improvements in the mechanism of my phonograph, whereby it is made more convenient and efficient in operation.

My object, especially, is to provide the phonograph with devices for determining automatically the exact position of the recording and reproducing points on the phonogram-cylinder, whether thick or thin, thereby avoiding the necessity of adjusting the presser-foot upon the guide-rest, in order to secure this relation each time a new or different size recording blank is used.

My object, further, is to provide a more efficient form of cutting-knife for turning off the surface of the phonogram-blank, to provide a more sensitive governor for regulating the speed of revolution of the phonograph-shaft, also to provide devices for disengaging the traveler-nut from the feeding-screw when the recorder or reproducer is lifted off of the surface of the blank, so as to prevent the wearing out of the feeding-screw thread by dragging the traveler-nut over it, and also to provide a suitable protecting-cover for the phonogram-blank, which will direct the wax cut into a receptacle beneath the cylinder, which will be so adapted to the machine as to enable the phonogram-blanks to be removed from and placed on the cylinder without removing the cover from the machine.

The invention consists in the several novel devices and combinations of parts, as fully hereinafter explained, and pointed out by the claims.

In the accompanying drawings, forming a part hereof, Figure 1 is a side elevation of the phonograph with the motor-box in section. Fig. 2 is a top view of the phonograph. Figs. 3 and 4 are views showing the two positions of the device for disengaging the traveler-nut from the screw-thread. Fig. 5 is an end view of the phonograph. Fig. 6 is a top view of the spectacle-frame with one of its

arms in section, showing the spring-lock for the presser-foot. Fig. 7 is a side view of one of the arms of the spectacle-frame, showing the automatic determination and locking devices. Fig. 8 is a view similar to Fig. 7, but from the other side of the arm. Fig. 9 is a view illustrating one of the functions of the automatic locking devices. Fig. 10 is a top view of the presser-foot, showing the attachment of the auxiliary presser-foot thereto. Fig. 11 is a perspective view illustrating the construction of the cutting-knife. Figs. 12 and 13 are views of the governor.

A is the phonograph-shaft carrying the phonogram-cylinder B, and provided with the fine feeding-screw *a*. The phonograph-shaft is rotated by an endless belt *b* from the motor C. Another endless belt *d* from the vertical shaft of the motor rotates the spindle D of the governor. This spindle carries centrifugal governor-balls *e*, mounted upon springs *f*, which move a sleeve *g* up and down upon the governor-spindle according to the position of the governor-balls. This sleeve *g* has an extended plain surface *g'*, upon which bears a circuit-spring *h*. It also has a disk *g²*, upon the under side of which bears the upwardly-turned end of another circuit-spring *h'*, which is mounted upon a spring *h²*, and is adjusted vertically by means of a nut *h³*. Now it will be seen that as the governor-balls lift the sleeve *g* the instant that the disk *g²* leaves the point of the circuit-spring *h'* the circuit will be broken. The spring *h* maintains a constant and perfect connection with the sleeve *g* by bearing upon its plain surface *g'*, so that the circuit is broken only at one point. By this form of governor I can maintain a more sensitive regulation of the speed of the motor. I do not find it necessary to use the magnet which I have heretofore employed, and as described in my application, Serial No. 281,453, filed July 30, 1888; but I can connect this governor directly with the armature of the motor and produce a more sensitive regulation without the intervention of the magnet. The rocking holding-arm E, which carries the swinging spectacle-frame F, is secured upon a sleeve G, upon which is loosely sleeved the traveler-arm H, having a sectional nut engaging with the feeding-screw *a*, as has been made plain by applications for patents al-

ready filed by me, and especially by said application, Serial No. 281,453. The traveler-nut is disengaged from the feeding-screw by the striking of the projection *i* on the sleeve G against the stud *i'* on the traveler-arm; but this does not occur until the spectacle-frame is thrown back to near the limit of its movement.

I have found it a convenient practice in using the phonograph to raise the spectacle-frame a short distance and move it along laterally by hand, so as to bring the recording or reproducing point at a different place upon the phonogram; but this movement drags the traveler-nut over the feed-screw and wears that screw out, since when the spectacle-frame is raised only part way the projection *i* does not strike the stud *i'*, and the traveler-nut is still in engagement with the feed-screw. To overcome this difficulty, I pivot upon the side of the traveler-arm H a prop-arm I, provided with two curved surfaces *j*, and a notch *j'*, engaging with a stud *k* and with the surface of a cam *k'*, mounted upon the end of the sleeve G. When the parts are in the position shown in Fig. 3, the spectacle-frame is lowered and the recording and reproducing point is in engagement with the phonogram. The traveler-nut also engages with the feeding-screw *a*. Now if the spectacle-frame is lifted the sleeve G is turned, and this turns the cam *k'* on the end of the sleeve, and the stud *k* in leaving the notch *j'* tilts the prop-arm I into a vertical position, and this prop-arm, having its lower end bearing upon the base-plate of the phonograph, lifts the traveler-arm a slight distance, sufficiently so to disengage the traveler-nut from the feeding-screw. The prop-arm is maintained in this position by the engagement of the curved surface *j* with the surface of the cam *k'*. The spectacle-frame can now be moved laterally to bring the recording or reproducing point to a new place on the phonogram, and the traveler-nut, being out of engagement with the feed-screw, will not wear such screw. In this movement the lower end of the prop-arm I slides along on the base of the phonograph. Now if the spectacle-frame is dropped the cam *k'* will be turned and the stud *k* will again engage the notch *j'*, tilting the prop-arm I into an inclined position and lowering the traveler-arm, so that the traveler-nut will engage the feed-screw.

My improved cutting-knife K (shown particularly in Fig. 11) is placed obliquely to the line of record, as shown. It is secured to the spectacle-frame in this position, and has its cutting end *l* curved, as shown, to conform to the shape of the surface of the cylindrical phonogram. By giving it this shape it cuts a wider chip, and the result is a greater smoothness in the surface of the phonogram-blank.

On account of the electrification of the chips or shavings which are cut from the surface of the phonogram-blank by the knife, I have found it necessary to cover the phono-

gram-blank as completely as possible with a protecting-cover L, to direct said particles into the receptacle provided for them and prevent them from becoming scattered over the machine and surrounding objects. This covers the entire upper half of the phonogram-blank with the exception of an opening on the front side of the cover, through which the recording and reproducing points act upon the surface of the blank, and so prevents the electrified particles from escaping and directs them into the receptacle provided for them beneath the cylinder. This cover L has lugs *m*, which are secured to the base of the phonograph, so as to support the cover from that end. At the other end of the cover a closing-plate L' is secured to the swinging arm M, which carries the movable center for the phonograph-shaft. The other end of the cover L is closed permanently. By mounting the closing-plate L' upon the swinging arm the phonogram-cylinder is entirely inclosed on its top side and ends, except for the opening through which the recording and reproducing devices act, and by swinging the arm outwardly the end of the cover will be opened, so that the phonogram-blank can be removed from the machine and a new one substituted for it without removing the cover entirely from the machine.

The principal feature of my present invention relates to means for determining automatically the precise relation which the recording or reproducing point should bear to the surface of the phonogram-blank. The spectacle-frame F has two arms N, one for each eye of the frame, and these project forward over a guide-rest O, each arm N having a presser-foot P, which bears upon the guide-rest and supports the spectacle-frame as it moves laterally in a definite relation to the surface of the phonogram-blank. Heretofore I have employed an adjustable screw, passing through each of the arms N of the spectacle-frame and bearing at its lower end upon the guide-rest. This construction made it necessary to adjust the spectacle-frame to the guide-rest every time a new phonogram-blank was placed upon the machine or the thickness of the blank reduced by cutting while on the machine. I find that it is possible to provide the machine with devices whereby each time the spectacle-frame is lowered the exact position of that frame with relation to the phonogram-blank will be automatically determined, so as to obtain the proper exact adjustment without skill on the part of the operator of the instrument. I have tried many different constructions of devices for this purpose, some of which were provided with a fixed determining-point, which would strike the surface of the phonogram-blank as the spectacle-frame is lowered, holding it in that position until a lock was operated by hand to fix the relation of the parts, when the determining-point would be moved away from the surface of the wax to prevent it from

wearing such surface, either by an independent movement or by the movement necessary to lock the presser-foot. I have also used devices having a movable determining-point, as one mounted upon a pivoted lever, the movement of which determining-point would either lock the presser-foot by its direct movement or release a spring-lock. Upon a number of these forms I propose to make separate applications for patents. The preferred construction is illustrated in the drawings by Figs. 5 to 10, and is one in which the determining-point is movable, and by its movement releases a spring-lock. The presser-foot P is a plate mounted upon the lower end of a bar P', which passes up through arm N. A spring n is connected with a pin at the upper end of the bar P' and with another pin upon the side of the arm N, and drawing downwardly upon the bar P' tends to project the presser-foot downwardly to the lowermost limit of its movement. The bar P' is provided with a V-shaped slot extending longitudinally, and into this slot projects the beveled end of a locking-bolt o, which is attached to a pivoted lever Q, projecting above the arm N and having a finger-piece p projecting forward over the end of the lifting-knob p' on the end of the arm N. A spring o' throws the locking-bolt o forward into engagement with the bar P'. The determining-point R is carried by a lever S and strikes the surface of the phonogram-blank close to the recording or reproducing point and approximately in line laterally therewith. The lever S is pivoted on the side of the arm N, and from that point projects upwardly, where its upper end engages with a stud q, projecting laterally from the upper end of the lever Q. The engaging end of the lever S is split and is provided with an adjusting-screw q', so that the exact point in the adjustment of the parts at which the end of the lever will be engaged and disengaged by the stud q can be accurately determined. The engagement of the stud q of the lever Q with the end of the lever S holds the bolt o out of engagement with the V-shaped slot of the sliding bar P'. The retracting movement is very slight, so that there will be little or no loss of movement in effecting engagement of the bolt with the sliding bar. The bolt being thus locked in a retracted position, if the spectacle-frame is lifted the presser-foot P will be projected to its lowermost position by the spring n, and as the spectacle-frame is lowered the presser-foot will strike the guide-rest O and the bar P' will slide upwardly through the arm N against the tension of the spring n. The downward movement continues against the tension of the spring n until the determining-point R strikes the surface of the phonogram-blank, when the slightest further movement disengages the end of the lever S from the stud q of the lever Q and the spring-lock is released, the bolt o being projected forward into engagement with the sliding bar P', and the presser-foot being locked rigidly in the position of adjustment, which is determined by the determining-point R. The lever S is then free, except for a slight forward spring-pressure, so that the point R, which is rounded, will ride over the surface of the phonogram-blank without injury thereto, the point being sufficiently wide to bridge a number of the lines of record. By having the finger p of the lever Q project over the lifting-knob p' the finger p will be pressed downwardly each time that the spectacle-frame is lifted, and the result will be the locking of this lever by the lever S and the releasing of the presser-foot each time the spectacle-frame is lifted, so that when the spectacle-frame is lowered again a readjustment of the parts will be had. As will be understood from applications for patents already filed by me, and especially from said application, Serial No. 281,453, my machine is provided with a tilting-bar T, placed in front of the guide-rest O and designed to raise the spectacle-frame and the traveler arm simultaneously, so as to effect a retracting movement. It is obvious that if this tilting-bar T is accidentally left in a tilted position, so as to engage the presser-foot before it strikes the guide-rest, as shown in Fig. 9, the adjustment would be secured with relation to this tilting-bar and not with relation to the guide-rest, and the operator then turning the tilting-bar down the result would be the throwing of the recording or reproducing point too far into the surface of the phonogram-blank. To prevent such an accident, I provide an auxiliary presser-foot r, forming the lower end of the lever r', which is pivoted upon the presser-foot P. The auxiliary presser-foot r projects normally below the presser-foot P. The lever r' is held against the pin s by means of a spring s', and thus secures this advance position of the auxiliary presser-foot. The upper end of the lever r' is provided with a tooth t, which engages with a pin t' on the side of the arm N. When the tilting-bar T is in its normal position, the auxiliary presser-foot r does not strike it, and the lever r' slides up and down, with the sliding bar P' against the pin s, without the engagement of the tooth t with the pin t'; but should the tilting-bar be accidentally left in a tilted position the lowering of the spectacle-frame will cause the auxiliary presser-foot r to first strike the tilting-bar, and this will throw the lever r' to one side, so that the tooth t will pass under the pin t'. This will hold the spectacle-frame in an elevated position and prevent it from being lowered. The operator will then observe the difficulty and turn the tilting-bar, the effect of which will be to cause the spring s' to throw the lever r' over against the pin s, when the presser-foot will strike the guide-rest and the proper adjustment will be secured. These devices for automatically determining the adjustment are mounted upon each of the arms N of the spectacle-frame, so that the adjustment will be per-

formed for the recorder as well as for the reproducer.

While the devices that I have described for determining automatically the adjustment of the recording and reproducing point with relation to the surface of the phonogram are preferred by me, I do not wish to limit the scope of my invention to such special devices, since many other forms can be employed, as I have before indicated.

What I claim as my invention is—

1. In a phonograph, the combination, with a frame carrying the recorder or reproducer and movable toward and away from the surface of the phonogram-blank and a guide-rest maintaining its relation with the phonogram-surface, of a determining-point carried by such frame adjusted with relation to the point of the recorder or reproducer and determining by contact with the phonogram-surface the proper relation of the recording or reproducing point therewith, substantially as set forth.

2. In a phonograph, the combination, with a frame movable toward and away from the surface of the phonogram-blank and carrying the recorder or producer, a guide-rest, and an adjustable presser-foot for supporting said frame from the guide-rest, of a determining-point carried by said frame, and determining by contact with the phonogram-surface the exact position of adjustment of the recording or reproducing point therewith, and a lock for locking the position of the presser-foot at such point of adjustment, substantially as set forth.

3. In a phonograph, the combination, with a frame carrying the recorder or reproducer and movable toward and away from the phonogram-surface, a guide-rest and an adjustable presser-foot supporting the frame from the guide-rest, of a movable determining-point carried by said frame, and determining automatically by contact with the phonogram-surface the proper adjustment of the recorder or reproducing point with said surface, and a lock for locking the presser-foot in that position of adjustment and for releasing the determining-point, substantially as set forth.

4. In a phonograph, the combination, with a frame movable toward and away from the phonogram-surface and carrying the recorder or reproducer, a guide-rest, and an adjustable presser-foot supporting the said frame from the guide-rest, of a movable determining-point carried by the frame, and determining automatically by contact with the phonogram-surface the adjustment of the recorder or reproducer therewith, and a lock for locking the presser-foot, automatically controlled or operated by the movement of the determining-point, substantially as set forth.

5. In a phonograph, the combination, with a frame movable toward and away from the phonogram-surface and carrying the recorder or reproducer, a guide-rest, and an adjust-

able presser-foot supporting the said frame from the guide-rest, of a movable determining-point carried by said frame and making contact with the phonogram-surface, and a spring-lock locking the presser-foot and released by the movement of the determining-point after it touches the phonogram-surface, substantially as set forth.

6. In a phonograph, the combination, with a frame movable toward and away from the phonogram-surface and carrying the recorder or reproducer, a guide-rest, and an adjustable presser-foot supporting the said frame from the guide-rest, of a determining-point formed by the end of a lever pivoted upon said frame, and a spring-lock locking the presser-foot and released by the movement of the determining-lever, substantially as set forth.

7. In a phonograph, the combination, with the movable frame and the guide-rest, of the presser-foot carried by a sliding bar, a spring throwing such presser-foot downwardly, and a lock for locking the presser-foot at any point of adjustment, substantially as set forth.

8. In a phonograph, the combination, with the movable frame, of the presser-foot thrown outwardly by a spring, a determining-point carried by the frame, and a lock for locking the presser-foot at the point of adjustment determined by the determining-point, substantially as set forth.

9. In a phonograph, the combination, with the movable frame and the automatic determining-point, of the presser-foot, a lock therefor, and a releasing-finger, which is grasped in raising the frame, substantially as set forth.

10. In a phonograph, the combination, with the movable frame, guide-rest, and tilting-bar, of the presser-foot projected outwardly by a spring and an auxiliary presser-foot having a locking-tooth and acting to lock the frame in an elevated position when the tilting-bar is turned, substantially as set forth.

11. In a phonograph, the combination, with a spectacle-frame carrying the recorder and reproducer in its two eyes, of separate arms for such eyes and the automatic adjustment-determining devices mounted upon each of such arms, substantially as set forth.

12. In a phonograph, a cutting-knife having an oblique cutting-point curved to conform to the curvature of the cylindrical phonogram-surface, substantially as set forth.

13. In a phonograph, the combination, with the rocking holding-arm, the traveler-arm, and the feed-screw, of a lifting-arm moved by the movement of the rocking holding-arm and serving to disengage the traveler-nut from the feed-screw, substantially as set forth.

14. In a phonograph, the combination, with the rocking holding-arm and the traveler-arm connected loosely together, of a cam moved by the lifting of the rocking holding-arm and a prop-arm worked by the movement of such cam, and serving to lift the traveler-arm

whenever the rocking holding-arm is lifted, substantially as set forth.

15. In a phonograph, the combination, with the phonogram-cylinder, of a cover covering its entire upper half, both top and ends, except for an opening through which the recording and reproducing devices act, substantially as set forth.

16. In a phonograph, the combination, with the phonogram-cylinder, of a cover covering

the top and ends of such cylinder, the outer end plate of such cover being mounted upon the swinging arm carrying the center, substantially as set forth.

This specification signed and witnessed this 15 12th day of January, 1889.

THOMAS A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

(No Model.)

2 Sheets—Sheet 1.

T. A. EDISON.

AUTOMATIC DETERMINING DEVICE FOR PHONOGRAPHS.

No. 430,277.

Patented June 17, 1890.

FIG. 1

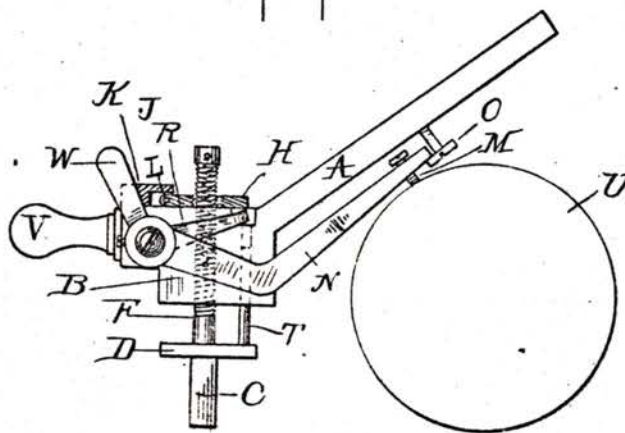
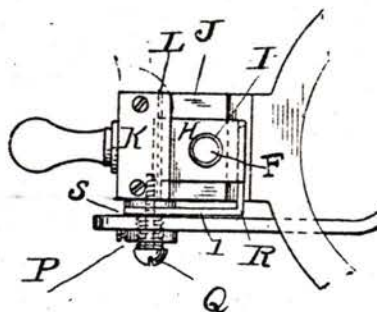


FIG. 2.



Witnesses
W. H. Leland
A. H. Rice

Inventor
Thomas A. Edison
 By *Attorneys* *John R. ...*

1225

(No Model.)

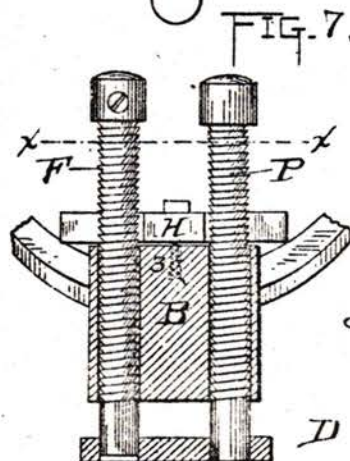
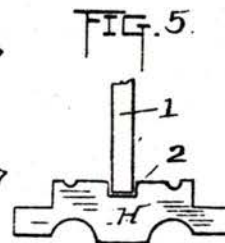
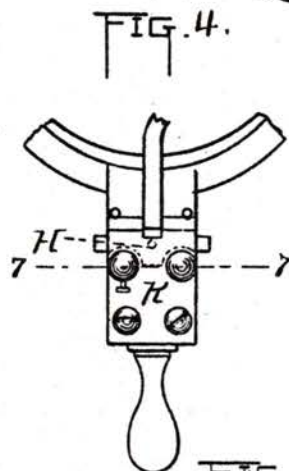
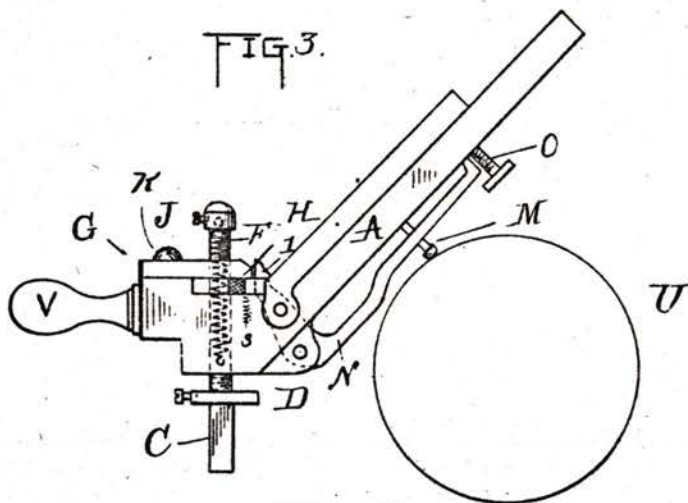
2 Sheets—Sheet 2.

T. A. EDISON.

AUTOMATIC DETERMINING DEVICE FOR PHONOGRAPHS.

No. 430,277.

Patented June 17, 1890.



WITNESSES:

E. C. Rowland,
A. H. Atwood

INVENTOR

Thomas A. Edison

BY

J. H. [Signature]
ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

AUTOMATIC DETERMINING DEVICE FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 430,277, dated June 17, 1890.

Application filed February 11, 1889. Serial No. 299,457. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful improvement in Automatic Determining Devices for Phonographs, (Case No. 825,) of which the following is a specification.

In my application, (Case No. 818,) Serial No. 296,420, filed January 15, 1889, I have described a preferred form of device for determining automatically the exact position of the recording and reproducing points on the phonogram-cylinder, whether thick or thin, and referred in general terms to other forms of device to accomplish the same purpose which I had tried.

My present invention relates particularly to that form of device referred to in said application, wherein the movement of the determining-point locks the presser-foot by its direct movement; and it consists in the several novel devices and combinations of parts, as fully hereinafter explained, and pointed out by the claims.

In the accompanying drawings, forming a part hereof, Figure 1 is a side elevation of a form of automatic determining device embodying my invention, showing the determining-point resting upon the surface of the phonogram-blank. Fig. 2 is a top plan view thereof, showing a small portion of the spectacle-frame. Figs. 3 to 7 show a modified form of device embodying my invention, of which Fig. 3 is a side elevation, Fig. 4 a top plan view, Figs. 5 and 6 are detail views of the locking-piece; and Fig. 7 is a section through the line 7 7 of Fig. 4.

The spectacle-frame A, bearing the recording or reproducing points, is similar in construction and mode of operation to the spectacle-frame described in my application above referred to and comprises two arms, but one of which B is shown, one for each eye of the frame. These arms project forward over the guide-rest C, and each arm is provided with a presser-foot D, which bears upon the guide-rest and supports the spectacle-frame as it moves along in a definite relation to the surface of the phonogram-blank U.

Referring to Figs. 1 and 2, the presser-foot

D is a plate mounted upon the lower end of a bar F, which passes up through arm B. A spring (shown in dotted lines) is connected to a pin at the upper end of the bar F and with another pin upon the side of the arm B, and drawing downwardly upon the bar F tends to project the presser-foot downwardly to the lowermost limit of its movement. The bar F is provided with a V-shaped spirally-cut thread, and with this thread engages a locking-piece II, which is formed of a plate having a screw-threaded circular hole I, the threads of which correspond to the threads on the bar F. The piece II is located on the rabbet J of the arm B between the rabbet and the plate K, and at one side is pivoted on the bar L, thus forming a gripping-eye which engages with the bar F when it is tilted. This locking-piece II is forced directly into engagement with the bar F by the movement imparted to the determining-point M when it comes in contact with the surface of the phonogram-blank. The determining-point M in the present instance is the point of an adjusting-screw and is mounted on a lever N, the movement of which is limited by the adjusting-screw O, and is connected with a sleeve P, free to rotate on a set-screw Q, working in the side of the arm B. On the sleeve P is also mounted the L-shaped arm R, the horizontal portion of which projects under and parallel with the locking-piece, and between the hub of which arm R and the hub of lever N is located a friction-disk S, of leather or other suitable material. The object of providing this friction connection between the lever N and arm R is to permit of the movement of both these parts in unison until the arm R meets with a resistance, when its further motion will be arrested without wholly preventing further motion of the lever P, which will still remain responsive to the inequalities of the surface of the phonogram-blank, thereby preventing mutilation of said blank.

The pin T, projecting from the presser-foot vertically into a socket on the arm B, serves to prevent the presser-foot from turning on the guide-rest.

The handle V serves to raise and lower the spectacle-frame and connected parts.

By manipulating the finger-piece W, which may be a continuation of the lever P, the

locking mechanism can be adjusted to the opened position when the device is ready for use. As the spectacle-frame is lowered the presser-foot will strike the guide-rest C and the bar F will slide upwardly through the arm B against the tension of the spring. The downward movement continues against the tension of the spring until the determining-point M strikes the surface of the phonogram-blank U, when the slightest further movement rotates the lever N, thereby throwing the rocking arm R upward against the locking-piece H, which, engaging with the bar F, effectually locks the presser-foot rigidly in the position of adjustment, which is determined by the determining-point. The lever bearing the determining-point, however, still is capable of movement by reason of the friction-connection, so that the determining-point will ride over the surface of the phonogram-blank without injury thereto.

Referring to Figs. 3 and 7 of the drawings, wherein parts similar to parts of Figs. 1 and 2 are similarly lettered, it will be seen that the modification consists principally in providing two bars F and P and a locking-piece H, capable of engaging with either bar, the locking-piece being thrown into engagement by the action of the short arm, which the lever N is provided with, which abuts against the recess 2 of the locking-piece. In this modification, as two screw-threaded bars F and P are used, the pin T of Figs. 1 and 2 may be dispensed with. The thread of these bars F P may be of one-half the pitch of the bar F of Fig. 1 if they are adjusted in the relationship shown in Fig. 7, where it will be seen that the broken straight line X X passes on the base of any thread on one of the bars F, but is about half a thread above the base of any thread on the other bar. By adjusting the threads of the bars F P, as just described, and providing the locking-piece H with a set of threads for each bar parallel to each other it follows that one or the other set of threads on the locking-piece will engage with one or the other of the bars F P, and thereby lock the arm of the spectacle-frame from further descent.

I have shown in Figs. 3 and 7 a coiled spring 3, situated under the locking-piece H. The object of this is to insure a readier locking of the parts, as the spring permits of a slight up-and-down motion of the locking-piece, so that it can adjust itself to the threads on the bars F, which may be in either a slightly higher or lower plane. The depth of the locking-piece H will be sufficiently less than the depth of the space between the rabbet J and plate K to permit of this slight movement. The depth of the threads on the locking parts is sufficiently great to permit of the locking thereof before the moving locking-piece reaches the bottom of the V-threads on the bar for the purpose of forming a variable connection. This variable connection permits the determining-point M

to ride lightly on the surface of the phonogram-blank, as if it meets with an unusually high protuberance on the surface of the blank the determining-point will force the moving locking-piece deeper into the V-threads on the bar; but when a lower portion of the blank is reached the determining-point will fall onto it, leaving the moving locking-piece, and a space will then be left between the moving locking-piece and lever bearing the determining-point, which permits a play between those parts.

Instead of providing the bars F F with threads approximately one-half out in position, they may be provided with threads which are parallel, and the piece H may be provided with threads approximately one-half out in position.

What I claim is—

1. In a phonograph, the combination, with the recording or reproducing frame movable toward and away from the phonogram-surface, a guide-rest, and an adjustable presser-foot supporting the said frame from the guide-rest, of a determining-point carried by said frame and making contact with the phonogram-surface, and a lock locking the spectacle-frame, operated directly by the movement of the determining-point after it touches the phonogram-surface, substantially as set forth.

2. In a phonograph, the combination, with the recording or reproducing frame movable toward and away from the phonogram-surface, a guide-rest, and an adjustable presser-foot supporting the said frame from the guide-rest, of a pivoted lever carrying a determining-point, said determining-point making contact with the phonogram-surface, and a lock locking the spectacle-frame, operated directly by the movement of the determining-point after it touches the phonogram-surface, substantially as set forth.

3. In a phonograph, the combination, with the recording or reproducing frame movable toward and away from the phonogram-surface, a guide-rest, and an adjustable presser-foot supporting the said frame from the guide-rest, of a determining-point carried by said frame and making contact with the phonogram-surface, a lock locking the spectacle-frame, operated directly by the movement of the determining-point after it touches the phonogram-surface, a movable determining-point carried by said frame and making contact with the phonogram-surface, a direct lock locking the spectacle-frame, and a variable connection between the locking parts, whereby the determining-point is enabled to ride lightly on the phonogram-blank, substantially as specified.

4. In a phonograph, the combination, with the recorder or reproducer frame movable toward and away from the phonogram-surface, a guide-rest, and an adjustable presser-foot supporting the said frame from the guide-rest, of a determining-point mounted on a pivoted lever, and a lock comprising a bar of

the presser-foot, and a piece actuated by the lever bearing the determining-point, substantially as set forth.

5 In a phonograph, the combination, with a movable frame and guide-rest, of a lock for locking said movable frame, comprising a bar and a piece movable toward and from said bar actuated by the contact of a movable determining-point with the phonogram, where-
10 by the determining-point is enabled to ride lightly on the phonogram-blank, substantially as set forth.

6 In a phonogram, the combination, with a movable frame and guide-rest, of a lock for
15 locking said movable frame, comprising two bars screw-threaded and set with relation to each other half a thread out, and a movable piece engaging with one or the other of said bars, actuated directly by the contact of the

determining-point with the phonogram-blank, 20 substantially as specified.

7 In a phonogram, the combination, with a movable frame and guide-rest, of a lock for locking said movable frame, comprising two
25 bars screw-threaded and set with relation to each other half a thread out, and a movable piece engaging with one or the other of said bars, actuated directly by the contact of the determining-point with the phonogram-blank, and having a spring whereby a slight up-and-
30 down play is given to said movable piece, substantially as and for the purposes set forth.

This specification signed and witnessed this 1st day of February, 1889.

THOMAS A. EDISON.

Witnesses:

W. PELZER,
D. H. DRISCOLL.

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 430,278.

Patented June 17, 1890.

FIG. 1.

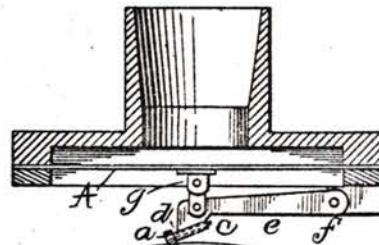


FIG. 2.

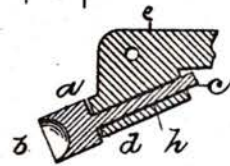


FIG. 4.



FIG. 3.

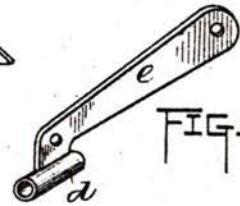


FIG. 5.

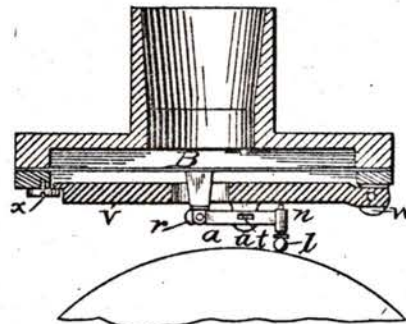


FIG. 6.

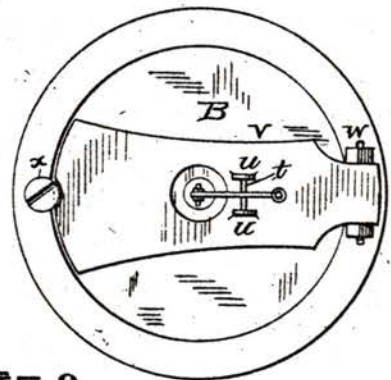


FIG. 7.

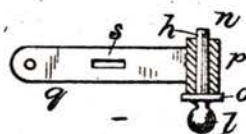


FIG. 9.

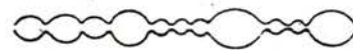


FIG. 8.



Witnesses
E. C. Howland
William Rye

Inventor
 Thomas A. Edison
 By his Attorneys
John F. Smith

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 430,278, dated June 17, 1890.

Application filed April 10, 1889. Serial No. 308,670. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 833,) of which the following is a specification.

This invention relates to the recording and reproducing points of the phonograph, and has for its objects such an improvement in the form and construction of such devices and in the manner of arranging and supporting the same as, in the first place, to materially improve the character of the sounds produced by the instrument, so as to make them more accurately reproduce the sound-vibrations communicated to the recorder than has heretofore been found possible; secondly, to make the instrument of a less delicate character and more readily manipulated and adjusted by inexperienced persons, and, thirdly, to enable the recording-point to be used for a longer period of time without having to be sharpened or reground or replaced by another.

One feature of my invention consists in the use of a recording-point having a cutting-edge, which is a portion of the edge of a cylinder and forms a gouging-edge, or one which cuts a rounded groove, so that the indentations due to the movements of such point are circular and with curved sides sloping to the center instead of square, and with straight sides, such as are produced by the straight-edged cutting-points which have heretofore been used. I prefer to employ a recording-point whose end is formed into a complete circular edge—that is to say, the end of a cylindrical head is cupped or hollowed out so as to produce a thin circular cutter, so that when one part of the edge becomes worn or dulled the stem may be turned and a different part of the circumference or a new curved cutting-edge is brought into position to operate on the phonogram-blank. To readily accomplish this and also to produce a means of holding the recording-point which shall enable the latter to be readily removed and easily replaced in position by unskilled persons, I provide the point with a shank which

is inserted into a socket and held therein removably, preferably by means of a little cement, which can be readily softened by heat, such as a small quantity of shellac. I prefer to support the reproducing-point in the same way, so that it also can be readily removed and replaced when necessary. I employ, also, a reproducing-point having a convex circular bearing-surface—that is to say, a bearing-surface which is the surface of a portion of a sphere. I prefer to employ as a reproducing-point a ball or sphere at the end of a suitable stem. This is supported so that it has a slight movement laterally of the record, and when traveling in the circular depressions formed by the recording-point it fits such depressions, and even if the lever which carries it is out of line with the record, so that the ball does not stand vertically in the record, or if it bears against the curved sides of the depressions, it reproduces the vibrations with the same exactness. The effect of the weight of the reproducing-point and attached parts is such, however, that the point always tends to go to the bottom or center of a depression. With the curved recording-point the whole depression forms the record of the sound-wave, and not only the bottom of it as with a straight recording-point, so that if the spherical reproducer touches the surface of the depression at any point it gives an accurate reproduction.

If a straight-sided reproducing-point gets out of line or tilted laterally, it does not reproduce accurately, and with straight-sided depressions if the reproducing-point bears against the sides it does not reproduce perfectly and it cuts through the sides and scrapes against them so as to produce imperfect articulation and injure the record itself.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a section of the case and mouth-piece of the recorder with the recording-point and attached parts shown in elevation and with the point itself on an enlarged scale; Fig. 2, a longitudinal section of the recording-point and holder therefor; Fig. 3, a perspective view of the holder and the lever which carries it; Fig. 4, a perspective view of a modified form of recording-point; Fig. 5, a

view of the reproducer, similar to Fig. 1; Fig. 6, a bottom view of the reproducer; Fig. 7, a side elevation of the reproducing-point and the parts which hold and support it, the tubular holder being shown in vertical section; Fig. 8, a view of a modified form of reproducing-point; and Fig. 9, an illustration of the form of the record produced by the arc-shaped recording-point, the view being of the character of a plan view.

The recording-point consists, preferably, of a cylindrical piece *a*, whose end is hollowed or cupped out, as illustrated in Fig. 2, so that a very fine and sharp circular edge *b* is formed. From the part *a*, which is the head of the recording-tool, a shank *c* extends, which is preferably round, and which enters a tubular holder *d*, attached by soldering or otherwise to the lower side of the usual lever *e*, pivoted at *f* on the rim of the reproducer, and connected at *g* with the center of the diaphragm *A*. Preferably the shank *c* is cemented in the holder *d* by the application of a little shellac or other suitable material *h*, which can readily be softened by heating it; but instead of this the secure removable attachment of the shank in the sleeve may be attained by suitable mechanical holding devices of various kinds, as will readily be seen.

It will be seen that only the lower portion of the circular tool meets the surface of the phonogram-blank, so that the cutting-edge in use at any time is shaped as the arc of a circle whose center is outside of the recording-surface. The circle of the cutting-edge is in practice exceedingly small, being necessarily exaggerated for illustration in the drawings. For a phonograph which has one hundred threads to the inch on its feed-screw, I prefer to make the diameter of the circular cutting-tool about forty-thousandths of an inch. It is of course not necessary for the production of the peculiar character of record desired that the edge shall be a complete circle. It may be a semi-circle or other portion of a circle, as illustrated in Fig. 4, in which the head *i* is formed at its lower side only with a cutting-edge *k*, shaped as the arc of a circle whose center is outside the recording-surface and provided like the other with a shank *c* for insertion in the holder. But by making it circular I provide several curved cutting-edges—two or more—and I enable the same recording-point to be used for a much longer time without having to be replaced or sharpened, for when any portion of the edge has been used long enough to become worn or dulled the cement in the holder may be softened by the application of a low degree of heat and the shank turned in the holder or withdrawn and inserted in a different position, so as to bring a fresh arc-shaped cutting-edge into operative position, and this may be repeated several times before the whole circumference has been used. It will be seen that this is an operation which does not require especially skillful manipulation, but

can readily be performed by any one, and this is an important advantage because the phonograph must necessarily be placed usually in the hands of unskilled and inexperienced persons. The advantages of the peculiar form of holder are, however, not confined to its use with the circular cutting-edge, for this evidently is a desirable form of holder for recording and reproducing points of any character when the same are provided with shanks or extensions capable of being inserted and held in the holder, since it enables such recording or reproducing points to be readily removed and replaced by any one without the exercise of any especial skill or knowledge and without any delicate adjustment, the parts being so arranged that when the head or other enlarged portion meets the holding-sleeve, the point is in the proper position for operation. It is evident, also, that the holding-sleeve and shank are not necessarily round in cross-section, since the same may readily be made square or of other polygonal shape. Of course in this case the shank cannot be turned in the sleeve; but it can readily be withdrawn, turned, and replaced in a new position.

The character of the record produced by the curved or arc-shaped cutting recording-tool is indicated in Fig. 9. It will be seen that such record takes the form of a series of circular pits or depressions whose walls curve toward the center or bottom point, and that the width of such depressions is in proportion to their depth, and also that every portion of each depression contains the record of the sound-wave, so that if the reproducer enters the depression and touches at any point it will receive the required movement corresponding to the impressed sound-wave.

The head of the reproducing-point is preferably a ball or sphere *l*, but it may be only a portion *m* of the sphere, as illustrated in Fig. 8. Such head preferably has a shank *n*, provided with a flange *o*, and such shank enters the holding-sleeve *p* until the flange meets the holder and is secured preferably in the same manner as hereinbefore described with reference to the recording-point—that is to say, by a small quantity of shellac or similar cement *h*, or screwed in.

The holder *p* is attached to or made in one piece with a lever *q*, which is connected at *r* in the usual manner by a hinge with the center of the reproducing-diaphragm *B*. The lever *q* has a slot *s*, and through such slot passes a pin *t*, extending between lugs *u*, which depend from a plate *v*, pivoted at *w* on the rim of the reproducer and kept from falling out of place *y* the head *x* of the screw on the opposite side of the rim from the pivot. The plate *v* forms a weight which bears on the reproducing-point and tends to force the same always to the bottom of the recorded indentations, the slot *s* allowing a slight lateral rocking movement of the reproducing-point so that if the lever is out of line with the record the point itself can rock into the

required position, and its having a rounded bearing-surface makes it immaterial whether it stands straight in the depression or is inclined toward one side thereof. The weight *v* also forms a retarding device, such as is described and claimed in my patent, No. 397,280, dated February 5, 1889, since it does not move under the quick vibrations communicated to the reproducing-point by the sound-record, but under slow movements due to irregularities or inaccuracies of the surface of the phonogram or eccentric movements of rotation it yields and permits the reproducing-point to conform to such irregularities.

15 What I claim is—

1. In a phonograph, the combination, with a diaphragm, of a recording-point carried thereby having a curved cutting-edge, substantially as set forth.

20 2. In a phonograph, the combination, with a diaphragm, of a recording-point carried thereby having a circular cutting-edge, substantially as set forth.

3. In a phonograph, the combination, with a record-surface, of a recording-point having a curved cutting-edge and entering said record-surface in an oblique direction, substantially as set forth.

4. In a phonograph, the combination of a cylindrical phonogram-blank, a diaphragm, and a recording-point carried by the diaphragm having a curved cutting-edge, substantially as set forth.

5. In a phonograph, a recording-point having two or more cutting-edges, in combination with a holder holding such point normally in a fixed position, and in which such position may be changed to bring such cutting-edges successively into operating position, substantially as set forth.

6. In a phonograph, a recording-point having two or more arc-shaped cutting-edges, in combination with a holder holding said point normally in a fixed position, and in which the position of the point may be changed to bring such edges successively into operating position, substantially as set forth.

7. In a phonograph, a recording-point having a circular edge, in combination with a holder holding such point normally in a fixed position, and in which the position of the point may be changed, substantially as set forth.

8. In a phonograph, a recording-point having two or more cutting-edges, in combination with a holder in which the point may be turned to bring such cutting-edges successively into operating position, substantially as set forth.

9. In a phonograph, the combination of a recording or reproducing point having a shank or extension, and a sleeve for holding the same, substantially as set forth.

10. In a phonograph, the combination, with a holding-sleeve, of a recording or reproducing point having a shank, and an enlarged

portion meeting said sleeve when the shank is inserted therein, substantially as set forth.

11. In a phonograph, a reproducing-point whose bearing-surface is the surface of a portion of a sphere, substantially as set forth.

12. In a phonograph, a spherical reproducing-point, substantially as set forth.

13. A sound-record consisting of circular indentations or depressions having rounded sides and corresponding to the sound-waves, substantially as set forth.

14. A sound-record consisting of circular indentations or depressions having rounded sides and corresponding to the sound-waves, in combination with a diaphragm and reproducing-point whose bearing-surface is the surface of a portion of a sphere, substantially as set forth.

15. In a phonograph, a reproducing-point pivoted so as to have a lateral movement, in combination with a weight bearing thereon, substantially as set forth.

16. In a phonograph, a reproducing-point having a bearing-surface which is the surface of a portion of a sphere and pivoted so as to have a lateral movement, in combination with a weight bearing thereon, substantially as set forth.

17. In a phonograph, a reproducing-point having a bearing-surface which is the surface of a portion of a sphere and pivoted so as to have a lateral movement, substantially as set forth.

18. In a phonograph, a laterally-rocking spherical reproducing-point, in combination with a weight bearing thereon, substantially as set forth.

19. A sound-record consisting of circular indentations or depressions corresponding to sound-waves, in combination with a reproducing-point whose bearing-surface is the surface of a portion of a sphere, and which is pivoted so as to have a lateral movement, substantially as set forth.

20. In a phonograph, the combination of the reproducing-point, the lever carrying the same and connected with the diaphragm, the hinged plate, and the hinge-connection between said lever and said plate, substantially as set forth.

21. In a phonograph, the combination of the reproducing-point, the lever carrying the same and connected with the diaphragm and having a longitudinal slot, the hinged plate, the lugs on said plate, and the pin connecting said lugs and passing through said slot, substantially as set forth.

22. In a phonograph, a recording-point having a cylindrical head provided with a cutting-edge and a shank or extension, substantially as set forth.

23. In a phonograph, a recording-point having a cylindrical head with its end hollowed to form a circular cutting-edge, substantially as set forth.

24. In a phonograph, a recording-point hav-

ing a cylindrical head with its end hollowed to form a circular cutting-edge and a shank or contracted extension, substantially as set forth.

5 25. In a phonograph, a reproducing-point having a head whose bearing-surface is a portion of the surface of a sphere, and a shank or contracted extension, substantially as set forth.

10 26. In a phonograph, a reproducing-point having a spherical head and a contracted shank, substantially as set forth.

27. In a phonograph, a reproducing-point having a spherical head, a contracted shank, and a flange on said shank, substantially as set forth.

15 28. In a phonograph, the combination, with a diaphragm, of a sleeve connected with said diaphragm so as to receive motion therefrom and a recording or reproducing point removably and rigidly held in said sleeve, substantially as set forth.

29. In a phonograph, the combination of a diaphragm, a lever connected therewith, a

sleeve carried by said lever, and a recording or reproducing point removably held in said sleeve, substantially as set forth.

30. In a phonograph, the combination of a diaphragm, a lever connected therewith, a sleeve carried by said lever, and a recording or reproducing point having a head and a shank or contracted extension removably held in said sleeve, substantially as set forth.

31. In a phonograph, a recording or reproducing point in combination with a holding-sleeve and a cement, such as will be softened by heat, holding said point in said sleeve, substantially as set forth.

32. In a phonograph, the combination of a recording-point having a curved cutting-edge and a reproducing-point having a rounded bearing-surface, substantially as set forth.

This specification signed and witnessed this 8th day of April, 1889.

THOMAS A. EDISON.

Witnesses:

WILLIAM PELZER,
D. H. DRISCOLL.

1234

(No Model.)

T. A. EDISON.
PHONOGRAM BLANK.

No. 430,570.

Patented June 17, 1890.

Fig. 1.

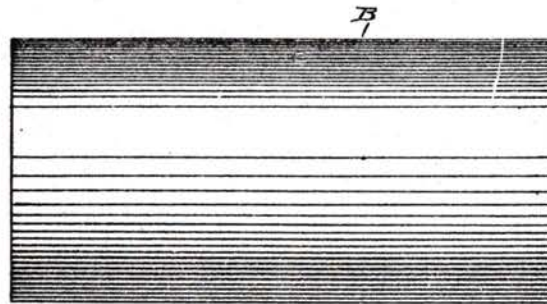


Fig. 2.

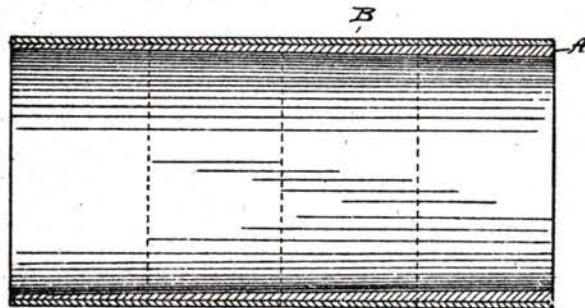
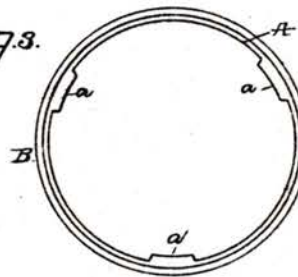


Fig. 3.



Witnesses
E. Howard
William P. Taylor

Inventor
Thomas A. Edison

By his Attorneys
Dyer & Seely

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 430,570, dated June 17, 1890.

Application filed November 26, 1887. Serial No. 256,188. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Improvement in Phonogram-Blanks, (Case No. 740,) of which the following is a specification.

The object I have in view is to produce an improved form of cylindrical phonogram-
10 blank for my phonograph which will be durable and light, will be cheap in construction, and will retain its shape and size under varying atmospheric conditions. This I accomplish by constructing as a base for the phono-
15 gram-blank or recording-surface a cylinder of molded material, which is made plastic by heat or moisture. I prefer for this purpose plaster-of-paris, although I may use sealing-wax or a mixture of shellac and sand, saw-
20 dust, or other material, or asphalt. The plastic material—say plaster-of-paris—is molded in cylindrical form and allowed to set, when the wax-like phonogram-blank surface is placed upon it and the surface is turned down
25 true in any suitable manner. The plaster-of-paris cylinder is given, preferably, a tapering bore, so as to be held by friction upon the tapering phonogram-cylinder of my phonograph. The phonogram-blanks will be made
30 the full length of the phonogram-cylinder, and these full-length phonogram-blanks will also be divided into sections, so that the smaller sizes can be used for letters or memoranda of short length.

35 In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of a phonogram-blank. Fig. 2 is a sectional view of the same, showing by dotted lines the di-

visions which will be made for producing sectional phonogram-blanks; and Fig. 3, an end
40 view showing a modified form of the tapering bore.

A is the cylindrical base, made of molded plastic material—such as plaster-of-paris—or a material which is heated to be made plastic
45 such as asphalt or sealing-wax. This cylinder has a tapering bore, as shown in Fig. 2, and a true cylindrical outer surface. The tapering bore may be formed by ribs *a*, as shown in Fig. 3. Upon this cylinder is placed a coat-
50 ing of wax or wax-like substance B, which forms the recording-surface.

I do not claim herein a phonogram-blank having a wax or wax-like recording-surface, or such a surface and a backing of tougher
55 material, since these matters are covered by my application for patent, (Case No. 734,) Serial No. 252,964. Neither do I claim a cylindrical phonogram-blank having a tapering bore, since this will be made the subject of a
60 separate application for patent.

What I claim is—

1. A phonogram-blank composed of a cylindrical base of molded material, having a tapering bore, and a recording-surface of
65 softer material, substantially as set forth.

2. A phonogram-blank composed of a base of plaster-of-paris and a recording-surface of softer material, substantially as set forth.

This specification signed and witnessed this
70 22d day of November, 1887.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

1236

(No Model.)

T. A. EDISON.

DEVICE FOR TURNING-OFF PHONOGRAM BLANKS.

No. 448,780.

Patented Mar. 24, 1891.

Fig. 1.

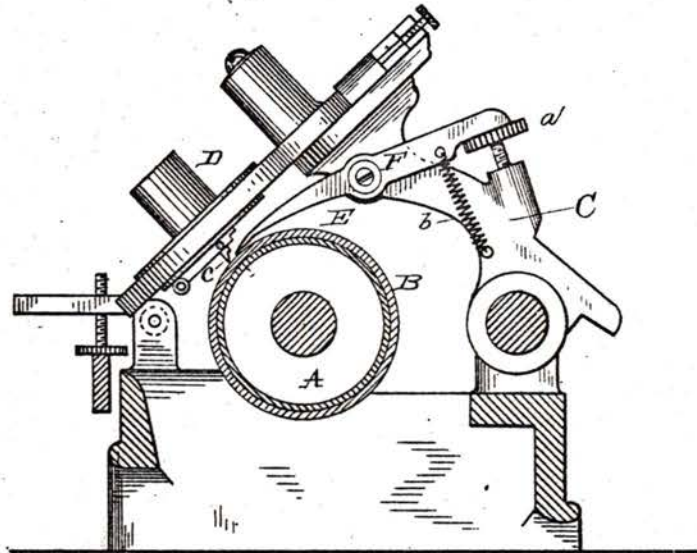


Fig. 3.

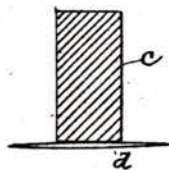


Fig. 2.

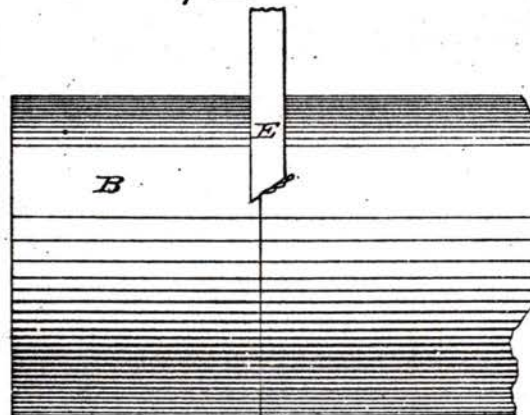
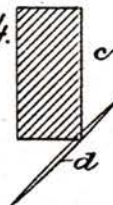


Fig. 4.



Witnesses.
Ed. Bowland
William F. Fyfe

Inventor
Thomas A. Edison
By his Attorneys Dyer & Smith

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

DEVICE FOR TURNING OFF PHONOGRAM-BLANKS.

SPECIFICATION forming part of Letters Patent No. 448,780, dated March 24, 1891.

Application filed July 7, 1888. Serial No. 279,322. (No model.)

To all whom it may concern.

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 784,) of which the following is a specification.

In my phonograph I employ a removable phonogram-blank having a recording-surface of a yielding material. I prefer to use a wax or a wax composition for the purpose, and I also prefer to make the entire blank of the wax or wax composition. These blanks after being mounted in the machine have their recording-surface turned true by a knife which is carried by the rocking holding-arm and the point of which is preferably in close proximity to the recording-point. The blanks used with my machine are also preferably adapted to have their surfaces turned off by this same cutting-tool for the purpose of using them a number of times, an old record being removed to make place for a new one.

I have heretofore employed as the cutting-tool a knife with its cutting-edge parallel with the axis of the phonogram-cylinder and practically at right angles to the track of record.

I have discovered that wax and similar yielding materials by reason of their elasticity and the cohesion of the particles are not turned off smoothly by the tool, but that microscopic cracks or breaks in the surface are formed which are parallel with the edge of the cutting-tool. To these cracks or breaks I attribute in a measure the production of foreign sounds by the record. These cracks or breaks are not as deep as the track made by the recording-point; but since the recording-point meets at the one time the resistance due to material of the full depth of its incision and at another time (when crossing a crack or break in the surface) a lesser body of material, I have found that the record produced is correspondingly affected, having irregularities causing false vibrations in the reproducer. I have found that the effect of these cracks or breaks is greatly modified, and the trouble arising from them largely overcome by so cutting or turning off the surface of the blank that the cracks will be oblique to the track of

record or the direction of relative movement of the surface and the recording-point. The improved effect, I think, is due to the fact that when the cracks are oblique the recording-point does not meet the crack across the full width of its advancing edge at one time, but only across a portion of such edge, and the disturbance is more gradual and is extended over a greater time.

In the accompanying drawings, forming a part hereof, Figure 1 is a vertical transverse section of a phonograph provided with a turning-off tool; Fig. 2, a view showing the phonogram-blank being cut by the tool; and Figs. 3 and 4 are views, on an exaggerated scale, showing the relation between the recording-point of the phonograph and the cracks in the recording-surface.

A is the revolving phonogram-cylinder, having the wax phonogram-blank B carried thereby.

C is the rocking holding-arm carrying the recorder D and the cutting-tool E. This tool is a knife mounted on the end of a lever F, pivoted to the arm C. The end of the lever F in rear of the pivot passes over the head of an adjusting-screw *a*; while a spring *b* draws it downwardly against said screw. The point of the knife E is oblique, as shown in Fig. 2, the cracks produced in the wax recording-surface by it being oblique to the track of record made by the point *c* of the recorder.

In Figs. 3 and 4 are shown in horizontal section the recording-point *c*, while *d* represents the cracks in the recording-surface. If those cracks are parallel with the advancing edge of the recording-point, as shown in Fig. 3, the recording-point will meet the cracks at the same time across the full width of its advancing edge, while if the cracks are oblique, as in Fig. 4, only a portion of the advancing edge of the recording-point will be in the crack at any one time, and the distributing effect of the crack will be distributed over a greater space of time, and hence will be more gradual.

In my application, Case No. 785, (Patent No. 393,465, dated November 27, 1888,) I have claimed the method of preparing the recording-surfaces of phonogram-blanks by cutting them oblique to the axis of the blanks or the tracks

of record, and hence that method is not claimed in this case, which relates to the phonograph provided with a knife for performing that method.

5 What I claim is—

1. The combination, in a phonograph, of a phonogram-blank for the reception of the record, means for making the record, and a cutting-tool with an edge oblique to the track of
10 record, substantially as set forth.

2. The combination, in a phonograph, of a phonogram-blank and means for turning the

same, a recording-point bearing on the surface of the blank and making a record thereon, and the turning-off tool supported on the recorder-carrying arm and having a cutting-edge oblique to the track of record, substantially as described.

This specification signed and witnessed this 30th day of June, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

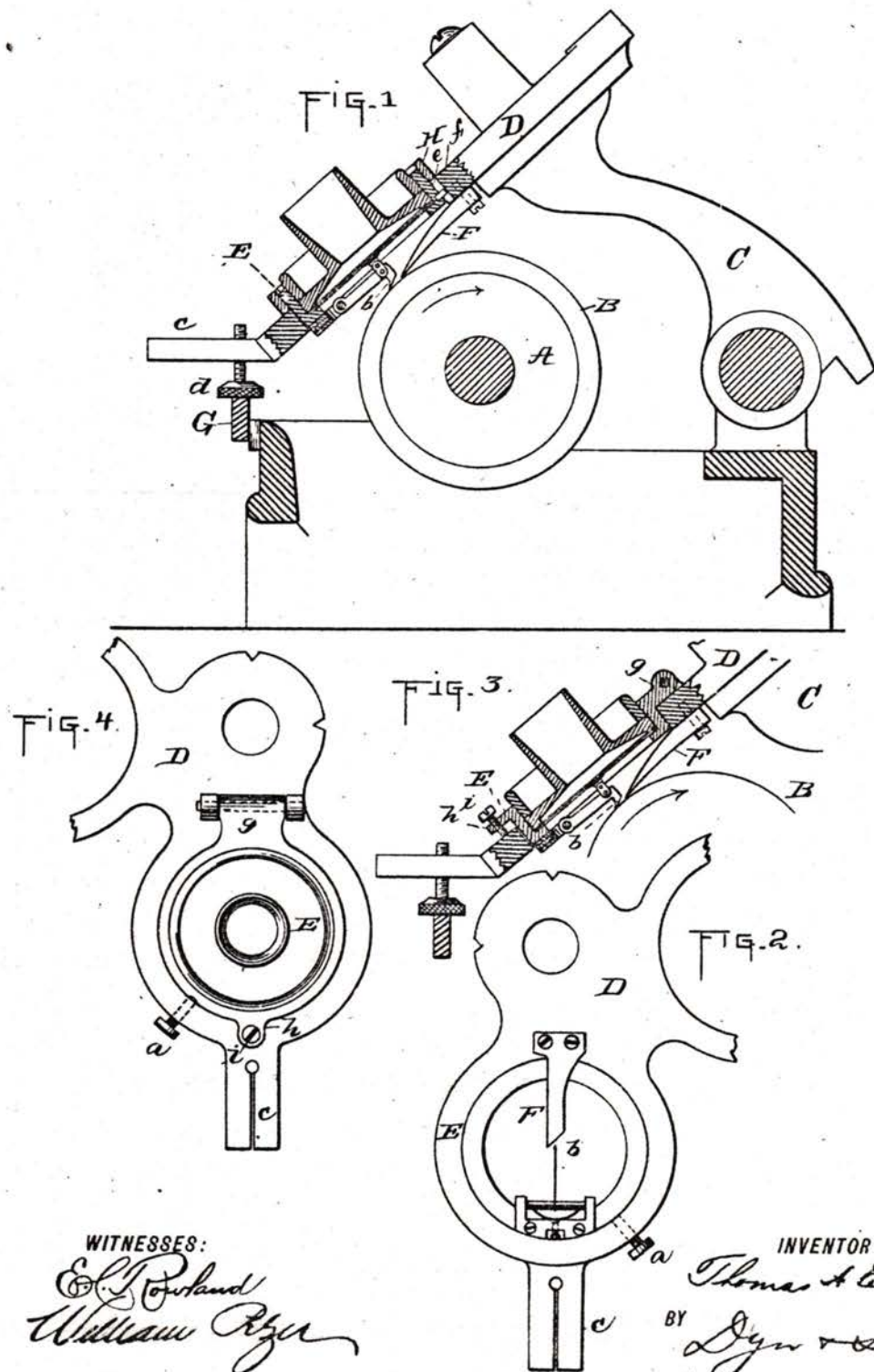
1239

(No Model.)

T. A. EDISON.
TURNING-OFF DEVICE FOR PHONOGRAPH

No. 448,781.

Patented Mar. 24, 1891.



WITNESSES:

E. J. Roland
William Rye

INVENTOR

Thomas A. Edison

BY

Dyn & Seely

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

TURNING-OFF DEVICE FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 448,781, dated March 24, 1891.

Application filed July 30, 1888. Serial No. 381,455. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex, in the State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 794,) of which the following is a specification.

My phonograph is provided with a knife for turning off the surface of the phonogram-blank, so that the blank may be used for successive records, and so that the blank will be true for receiving the record on the particular machine. The knife acts with the recorder, the old record being removed and the new one being made at the same time. Heretofore such knife has been mounted on the rocking holding-arm of the machine, the knife being held by a lever pivoted upon the rocking holding-arm and provided with an adjusting-screw for raising and lowering the point of the knife. The position both of the recorder and the cutting-knife is simultaneously adjusted with reference to the recording-surface by means of an adjusting-screw bearing on a straight guide-rest, along which it travels as the rocking holding-arm is advanced by the feed-screw. As the cutting-knife has been heretofore employed its proper adjustment required considerable skill, since it not only had to be adjusted to properly cut the surface of the phonogram-blank, but also had to be adjusted with relation to the recording-point, so that the recording-point would at the same time track properly on the surface in rear of the cut of the knife, and this adjustment had to be such that the common adjustment of both these elements by the set-screw on the guide-rest could be made without disturbing the relation between the cutting-knife and the recording-point.

The object I have in view is to so construct the parts that a much simpler adjustment will be permitted, and a further object is to so mount the cutting-knife upon the machine that it will be moved laterally toward and away from the recording-surface with the recorder.

In carrying out my invention the cutting-knife is mounted rigidly and without adjustment upon the machine, and the recorder itself is provided with an independent adjust-

ment toward and away from the recording-surface. This makes it possible to first manipulate the guide-rest adjustment until the knife cuts a proper shaving from the surface, and then to adjust the recorder independently of the spectacle-frame which carries it, while holding the speaking-tube to the ear, so that when the recording-point is properly tracking on the surface of the blank the operator will be made aware of the fact by the continuous and uniform scraping noise. This makes an exceedingly simple and perfect adjustment, and one which will permit the guide-rest adjustment to be afterward made, lowering the recording-point and the knife for subsequent records without changing their relation. In order to best fix the position of the knife and the recording-point against possible disturbances, I prefer to mount the knife directly upon the swinging spectacle-frame which carries the recorder. By this construction, also, the knife is moved laterally away from the record with the recorder.

In the accompanying drawings, forming a part hereof, Figure 1 is a sectional view of the phonograph, showing the knife in position for operation. Fig. 2 is a bottom view of a part of the spectacle-frame, showing the knife and the recorder. Fig. 3 is a view similar to Fig. 1, showing a different means for adjusting the recorder; and Fig. 4 is a top view of the spectacle-frame with the adjusting means of Fig. 3.

A is the turning phonogram-cylinder of my machine, carrying the phonogram-blank B. The advancing rocking holding-arm C has pivoted to its upper end the swinging spectacle-frame D, having two eyes, one of which carries the recorder and the other the reproducer. This frame is swung laterally to bring either of these instruments into operative relation with the surface of the phonogram-blank. The recorder and reproducer are instruments complete in themselves and separable from the machine, each being carried by an annular frame E, which is inserted in the eye of the spectacle-frame, and is secured therein by a set-screw *a*. The recording-point projects beyond the ring-frame E, in order to indent the surface of the phonogram-blank. F is the knife or turning-off tool. It is preferably attached to the under side of the swing-

ing spectacle-frame D just above the eye holding the recorder. It is fastened rigidly in position to the spectacle-frame and projects toward the point of the recorder, which it approaches as closely as possible, and terminates in an oblique cutting-edge. The eye of the spectacle-frame carrying the recorder is provided with a finger *c*, through which passes a set-screw *d*, resting on the straight guide-rest *G*, along which it travels. By adjusting the screw *d* the cutting-knife and the recorder are simultaneously moved toward and away from the surface of the phonogram-blank. In order to secure the proper relative adjustment between the recording-point and the cutting-knife, I make the recorder independently adjustable in the eye of the spectacle-frame, so that independently of the guide-rest adjustment the recording-point can be adjusted toward and away from the surface of the blank. This adjustment of the recorder may be secured in various ways. Two means for securing the adjustment are illustrated by the drawings. In Fig. 1 a screw-ring *H* is shown, which embraces the edge of the annular frame *E* of the recorder and forms a shoulder for such frame, which rests upon the spectacle-frame. By adjusting the screw-ring *H* the depth to which the recorder enters the eye of the spectacle-frame can be varied and the recording-point moved toward or away from the recording-surface. A slot *e* and pin *f* may be employed to prevent the turning of the recorder when the adjusting-screw *H* is being turned.

In Figs. 3 and 4 the annular frame *E* of the recorder is shown as hinged upon the spectacle-frame, it having an upwardly-extending lug *g* resting between two lugs on the spectacle-frame and pivoted by a cross-pin which is removable. Opposite to the lug *g* the annular frame *E* of the recorder is provided with a lug *h*, through which an adjusting-screw *i* sets against the top of the spectacle-frame. It is evident that by adjusting the screw *i* the recorder will be adjusted more or less into or out of the eye of the spectacle-frame. With either of the adjustments already described the set-screw *a* is used to secure the recorder rigidly in position after the proper adjustment has been obtained.

In adjusting the parts the recorder may be first raised so as to clear the surface, and the screw *d* can then be adjusted to let the knife down upon the surface of the blank until it is seen that the knife is cutting a proper shaving to remove the old record. The speaking-tube is then connected with the recorder, and is held to the ear of the operator while the recorder is adjusted toward the surface by turning the screw-ring *H* or the set-screw *i*. When the operator ascertains that the recording-point is tracking properly by hear-

ing the continuous and uniform sound of the recorder in cutting the surface, then he knows that the proper adjustment has been secured. He then binds the recorder in place by means of the set-screw *a*. The adjustment being once secured, the relation between the recording-point and the cutting-knife will be maintained for subsequent manipulations of the guide-rest adjustment, so that the screw *d* can be adjusted to lower the recording-point and the cutting-knife simultaneously. It is only when the recorder is removed for any particular purpose and is again placed in position that the parts have to be readjusted. It will be seen that the cutting-knife, being mounted directly upon the spectacle-frame, swings with such spectacle-frame, and is brought into and out of operation with the recorder by the lateral swinging of the spectacle-frame.

What I claim is—

1. In a phonograph, the combination of a cutting-knife mounted rigidly and without an adjustment on the machine and a recorder adjustable with relation to said cutting-knife, substantially as set forth.

2. In a phonograph, the combination, with the rocking holding-arm, the guide-rest, and the guide-rest adjustment, of a recorder carried by a frame supported by the rocking holding-arm and the guide-rest, said frame having an adjustment toward and away from the recording-surface, and said recorder having an adjustment toward and away from the recording-surface additional to the adjustment of said frame, substantially as set forth.

3. In a phonograph, the combination, with the rocking holding-arm, the guide-rest, and the guide-rest adjustment, of a cutting-knife and a recorder supported from said rocking holding-arm and said guide-rest, said cutting-knife mounted rigidly and without adjustment on the machine, and said recorder being independently adjustable with relation to said cutting-knife, substantially as set forth.

4. In a phonograph, the combination, with the swinging spectacle-frame carrying the recorder, of the cutting-knife mounted upon such swinging spectacle-frame, substantially as set forth.

5. In a phonograph, the combination, with the rocking holding-arm, the swinging spectacle-frame, the guide-rest, and the guide-rest adjustment, of the cutting-knife secured to such swinging spectacle-frame and having a fixed position thereon and the recorder adjustably held by said swinging spectacle-frame, substantially as set forth.

This specification signed and witnessed this 16th day of July, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

1242

(No Model.)

T. A. EDISON.
PHONOGRAPH RECORDER.

No. 450,740.

Patented Apr. 21, 1891.

FIG-1

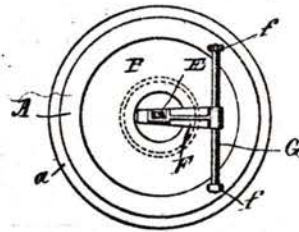
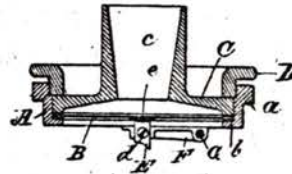


FIG-2



WITNESSES:

Ed. Rowland
William Pizer

INVENTOR

Thomas A. Edison
BY *Sign & Seely*
ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH-RECORDER.

SPECIFICATION forming part of Letters Patent No. 450,740, dated April 21, 1891.

Application filed July 17, 1888. Serial No. 280,205. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex, in the State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Recorders, (Case No. 787,) of which the following is a specification.

This invention relates to the recording-instrument of my phonograph; and its object is to simplify the construction of such instrument, and, further, to adapt such instrument for adjustment to make it most effective with voices differing in pitch and volume. I have found that an increased efficiency is given the recorder if it is capable of adjustment, so as to be more sensitive when used by people having weak voices. With voices of greater volume I have also found that it is necessary to reduce this sensitiveness.

In the accompanying drawings, forming a part hereof, Figure 1 is a bottom view of the recorder, and Fig. 2 is a vertical section of the same.

My phonograph-recorder is composed of a ring A, which is adapted to fit one of the eyes of the spectacle-frame of my phonograph, and has an external shoulder a, which rests on the spectacle-frame. This ring is bored out, leaving at its bottom an internal shoulder b. Upon the shoulder b rests the glass diaphragm B, which is held at its edge between two rubber rings, one being placed below and the other above the edge of the glass diaphragm. Above the diaphragm is inserted in the ring A a follower-plate C, which rests upon the rubber ring above the diaphragm and is hollowed out, so as to leave a space between it and the diaphragm. This follower-plate has a tube c arising from it, to which is connected the flexible speaking-tube of the phonograph.

The ring A is internally screw-threaded at its upper portion and receives a screw-ring D, which turns within the ring A down upon the edge of the plate C. The plate C does not turn when the screw-ring is turned, but is forced with more or less pressure upon the rubber ring above the diaphragm. It will be seen that by turning the screw-ring D, which forms a nut, the diaphragm will be clamped with more or less firmness, according to the adjustment of the screw-ring. If the dia-

phragm is held with a light pressure, it will be much more sensitive to sound-vibrations than if clamped firmly. Thus the recorder is given the capacity for adjustment to adapt it to the voices of different operators. The best adjustment for each operator, of course, can only be determined by trying the effects of various adjustments by reproducing the sound-vibrations from the record.

It is evident that various constructions can be employed to make phonograph-recorders adjustable in their sensitiveness, and, while I prefer to use that just described, I wish it understood that my invention is not limited in its scope to the one construction.

The recording-point E of the recorder is a plate of steel held by a screw d, which passes laterally through this plate into a lever F. The plate E is secured to the center of the diaphragm by cement e. The recording-point is free to move freely through the entire amplitude of the diaphragm-vibrations, it being unobstructed by stops to regulate the distance of its movement. This plate is ground to a point at one edge, and this point is then buffed with rouge. By buffing the point it is given an exceedingly high polish, which is a matter of considerable importance, since without the buffing the point under the microscope shows a gray surface, which is an indication of the presence of minute points, which I have found to affect the clearness of the record. These points are removed by the buffing.

The lever F is a short stiff lever secured to a long pin G, which crosses the bottom of the ring A within its periphery, and is pivoted at its ends in blocks f, secured to the bottom of such ring. This long pin-bearing and the rigid lever make an exceedingly stiff support for the recording-point, and one which does not produce false vibrations. The lever is entirely free, except for the cementing of the recording-point to the diaphragm—i. e., it has no spring which presses it either against the diaphragm or away from it. This simple construction I have found to be exceedingly efficient.

What I claim as my invention is—

1. In a phonograph-recorder, the combination, with a recording-point, of the diaphragm, the follower-plate, and the screw-ring, substantially as set forth.

2. In a phonograph-recorder, the combination, with the diaphragm and holding-ring, of a free lever mounted in bearings upon such holding-ring, and an indenting-point mounted upon such lever and attached directly to the diaphragm, substantially as set forth.

3. In a phonograph-recorder, the combination, with the diaphragm and the holding-ring, of a short stiff lever, along pin-bearing to which such lever is secured, such pin being pivoted on the holding-ring, and the indenting-point

secured to the free end of the stiff lever and attached to the diaphragm, such lever being free to turn on its bearing except for the attachment of the indenting-point to the diaphragm, substantially as set forth.

This specification signed and witnessed this 14th day of July, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
A. W. KIDDLE.

1245

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 453,741.

Patented June 9, 1891.

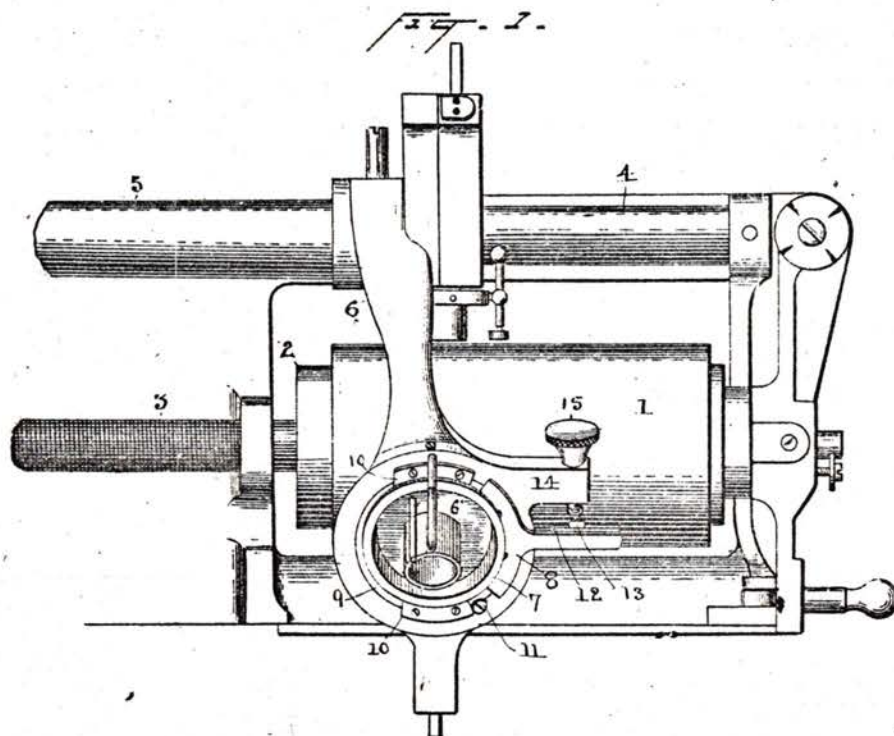


FIG. 2.



FIG. 3.

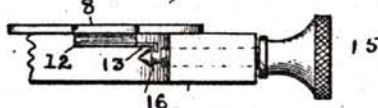
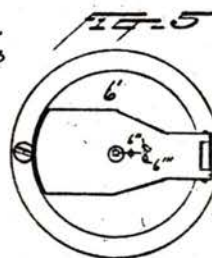


FIG. 4.



Witnesses
Thomas A. Black.
Ed. R. R.

Inventor
T. A. Edison.
By his Attorneys.
Hart Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 453,741, dated June 9, 1891.

Application filed July 30, 1890. Serial No. 360,348. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 868,) of which the following is a specification.

The invention consists in novel means for adjusting a phonograph reproducing-point into exact alignment with the phonogram-record.

The invention also consists in means for limiting the movement of the diaphragm which supports the recording and reproducing point when turned to place the reproducer out of operative position and the recorder into operative position.

In the accompanying drawings, which illustrate the invention, Figure 1 is a plan view of so much of a phonograph as is necessary to illustrate the improvement. Figs. 2, 3, and 4 are views of details which will be hereinafter referred to. Figs. 5 and 6 show the recorder and reproducer on a single lever connected to the diaphragm.

1 is a phonogram-blank mounted on a phonogram-cylinder 2, which is turned by the screw-shaft 3 in the usual manner.

4 is the guide-rod on which the sleeve 5, carrying the arm 6, which supports the recorder and reproducer, and which is moved along by a feeding-arm co-operating with the screw 3, is mounted in the usual or any suitable manner.

6' is the phonograph-diaphragm, which, as is well known, supports both the recorder and reproducer, so mounted that when the diaphragm is in one position the recorder 6'' is in operative relation to the phonogram-blank, and in a second position the reproducer 6''' is in operative relation to said blank.

The recorder and reproducer on the under side of the diaphragm are shown in Figs. 5 and 6 of the drawings, the arrangement being the same as described in my application, Serial No. 330,789, filed November 13, 1889. The diaphragm is supported in ring or frame 7. To this ring is fastened an extension 8. The ring is held in place by a flange 9, which extends under the plates or other holding devices 10.

11 is a screw with a conical head placed in such position that it serves to limit the movement of the arm 8 away from the adjusting device 15, and hence to limit the turning movement of the diaphragm. On one side of the extension 8 is an arm 12, preferably in the form of a spring with a projection 13.

14 is an extension of the arm 6, in which is mounted a thumb-screw 15, the point of which is conical and which is grooved near said point, as indicated at 16, or is otherwise so arranged as to positively engage with arm 12 or with the recorder-support.

The apparatus above described is used as follows: When the arm 8 is moved downward, bringing the recorder-support or an extension thereof against the limiting device 11, it will be understood that the recording-point is in position over the blank. The screw 11 is set in the best position before the phonograph is sent out, and is not intended to be moved except when the range of movement of the arm 8 varies, owing to wear of any parts of the instrument or other cause. When it is desired to reproduce, the arm 8 is moved upward by the hand until arm 12 is positively engaged by the point of screw 15. The hearing-tube is put to the ear, and if it appears from the sound that the reproducing-point is not in line with the phonogram-record the adjusting-screw is turned, thus moving the extension, and hence the diaphragm and reproducing-point until the reproducer is brought into the track of the record. It will be seen that the diaphragm and the supporting-ring turn around an axis, but do not move bodily from one position to another. When it is desired to again put the instrument into position to record, the extensions 8 and the arm 12 are grasped by the hand and pressed together, thereby disengaging the latter from the screw, when the parts may be moved downward.

Having thus described my invention, what I claim is—

1. In a phonograph, the combination of a movably-supported phonograph-diaphragm, an adjusting-screw, and means for making a positive engagement between said screw and diaphragm, whereby the diaphragm may be moved to adjust the reproducer, substantially as described.

2. In a phonograph, the combination, with a diaphragm and a support therefor, of an extension from said support, an arm on said extension, and an adjusting-screw the point of which has means for engaging with said extension, substantially as described.

3. In a phonograph, the combination, with a diaphragm and a support therefor, of an extension from said support, a spring-arm on said extension, and an adjusting-screw the point of which is conical and which is grooved for engagement with the spring-arm, substantially as described.

4. The combination, in a phonograph, of a diaphragm, a support therefor, an extension for moving said support, and an adjusting-screw acting on said extension in the direction of its motion to bring the diaphragm in position for reproducing, substantially as described.

5. In a phonograph, the combination of a diaphragm, a support therefor which can be turned on its axis, and an adjustable limiting-stop whereby the turning movement of the diaphragm may be limited, substantially as described.

6. In a phonograph, the combination of a diaphragm to which is connected an operating-point, a support for the diaphragm, mounted to turn around the axis of the diaphragm, an extension from said support, and a limiting-stop, substantially as described.

This specification signed and witnessed this 5th day of July, 1890.

THOS. A. EDISON.

Witnesses:

E. COURAN,
W. PELZER.

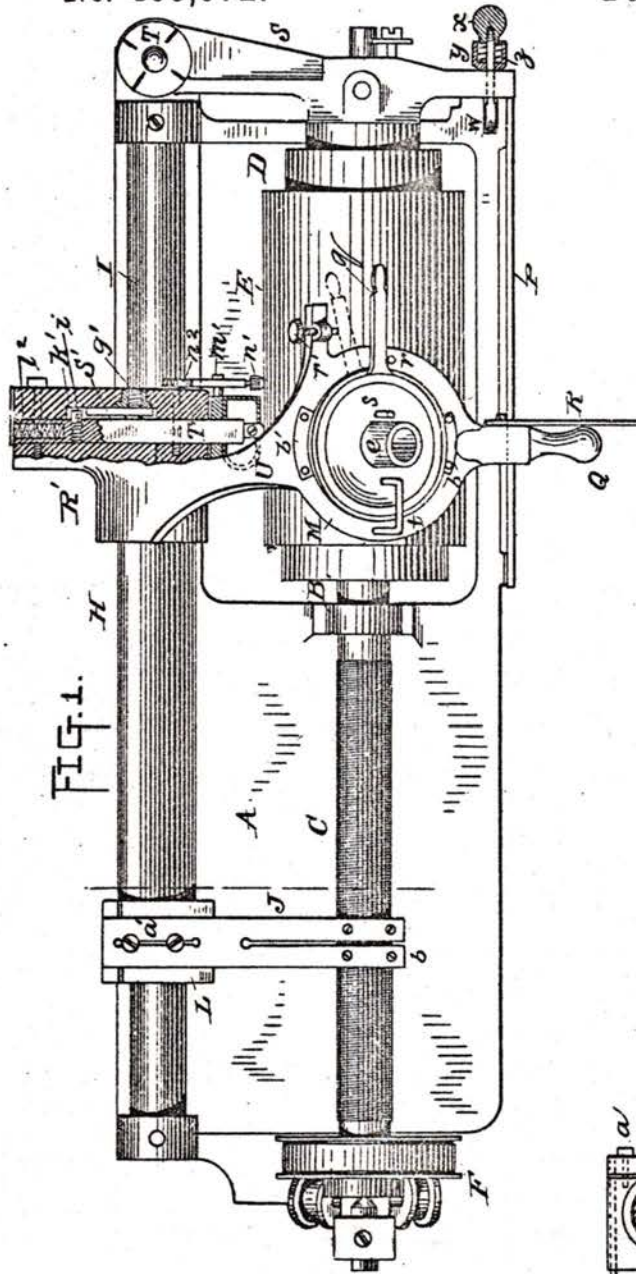
(No Model.)

2 Sheets—Sheet 1.

T. A. EDISON.
PHONOGRAPH.

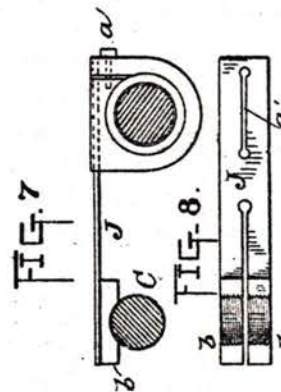
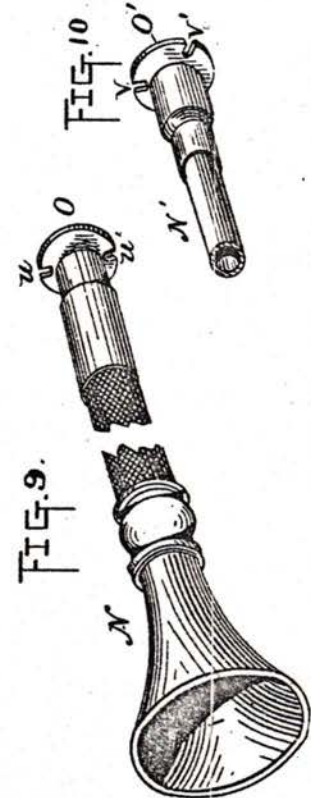
No. 465,972.

Patented Dec. 29, 1891.



WITNESSES:

Ed. Rowland.
W. P. Ryan



INVENTOR

Thomas A. Edison

BY

J. P. Lacy
ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

T. A. EDISON.
PHONOGRAPH.

No. 465,972.

Patented Dec. 29, 1891.

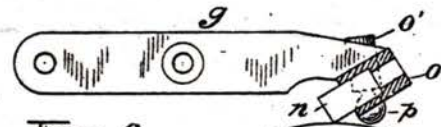
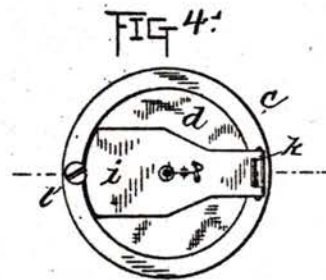
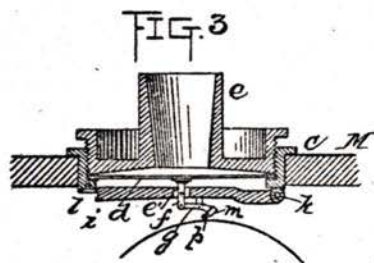
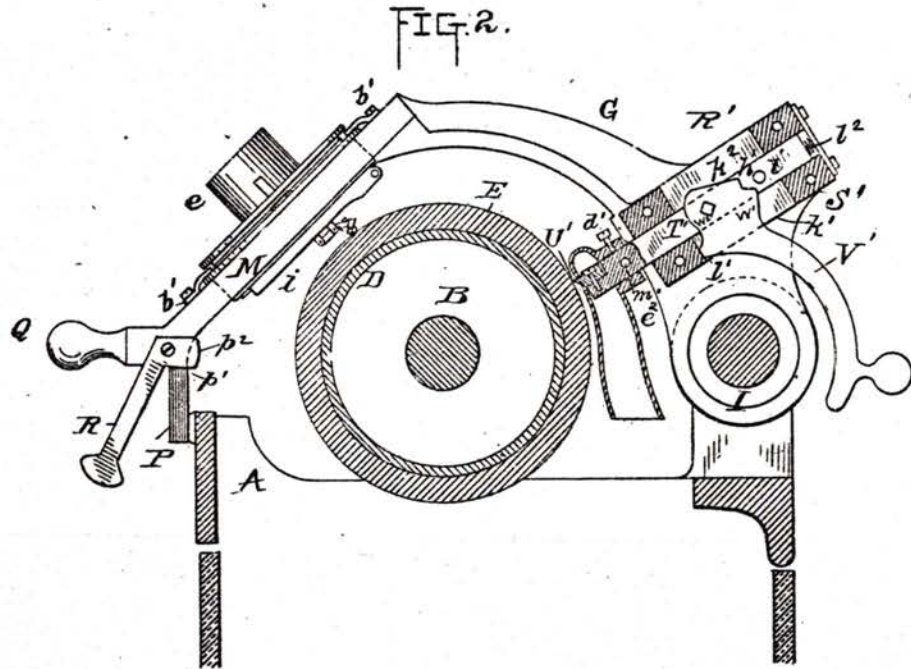


FIG. 6.

WITNESSES:

E. B. Rowland
W. H. Ryan

INVENTOR

Thomas A. Edison

BY

J. P. [Signature]
ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 465,972, dated December 29, 1891.

Application filed November 18, 1889. Serial No. 330,789. (No model.)

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographs, (Case No. 847,) of which the following is a specification.

The object of my invention is to increase the simplicity in construction and operation of the phonograph by decreasing the number of parts of which the machine is composed, by lessening or avoiding the necessity for adjustment of the various parts in practice, and by increasing the convenience of manipulation of the machine. To this end I have made many changes in the machines described in my previous patents and applications, all with the objects of increased simplicity, convenience, and efficiency.

Heretofore I have employed separate diaphragms and holders therefor for the recording and reproducing points, these being held in the two eyes of a spectacle-frame, supported so that either could be swung into position over the phonogram-cylinder.

One feature of my invention is an improvement upon this arrangement; and it consists in attaching both the recording-point and the reproducing point to the same diaphragm, and so arranging the parts carrying such diaphragm that by a simple movement either the recording or the reproducing point may be placed in operative position. I so connect these parts with the diaphragm that no adjustment of the recording-point is required to give the right depth to the record, it being so arranged that it will itself assume the proper position on the record-surface. In addition to this feature, which is perhaps the most important of the improvements which constitute my present invention, I have further improved the construction and use of the turning-off tool for removing the record from the cylinder, the devices for supporting the frame which carries the recorder and reproducer and for raising the same off the phonogram surface, the feeding devices for moving the recorder and reproducer along the cylinder, the means for attachment of mouth-pieces or ear-tubes to the machine, and the means for holding the cylinder in place.

My invention is illustrated in the accompanying drawings.

Figure 1 is a top plan view of the phonograph embodying my invention, the motor or other means for revolving the cylinder being omitted and the holder for the turning-off tool being shown in longitudinal section; Fig. 2, a transverse vertical section of the machine; Fig. 3, a vertical section of the improved recorder and reproducer; Fig. 4, a bottom plan view of the same; Fig. 5, an enlarged bottom view of the recorder and reproducer without the diaphragm and frame; Fig. 6, an exaggerated side elevation and partial section of the recording and reproducing points; Fig. 7, a sectional view of my improved feeding device; Fig. 8, a bottom view of the same; Fig. 9, a perspective view of the mouth-tube used with the machine, and Fig. 10 a perspective view of a part of the ear-tube.

The machine is mounted upon a suitable base A.

B is the cylinder-shaft, provided with the feed-screw C.

D is the phonogram-cylinder, and E the phonogram-blank placed thereon.

The shaft B is rotated by a belt passing over the pulley F from a suitable motor or in any other convenient way. The rocking holding-arm G is carried by a sleeve H, sliding on the rod I, and such sleeve carries the traveler-arm or feeding device, which consists of a flat spring J, secured to a collar L, which is clamped upon the sleeve H by a screw *a*. The spring J is split at its outer end and carries two nut-sections *b b*, which engage the feed-screw C and are provided with fine threads corresponding to the thread C. This furnishes a more, simple arrangement than that heretofore used by me. The flexibility of the spring holds the threads in engagement, and the spring being split a divided arm is formed, so that in case one nut-section fails to engage the feed-screw the other will, they being substantially independent. By means of the slot *a'* the feed-arm is adjusted in the manufacture of the machine to the right position.

The rocking arm G carries at its outer end a single circular receptacle M, instead of an adjustable spectacle-frame, as heretofore.

The receptacle M holds the combined recorder and reproducer, the external parts of which are made substantially as heretofore. The annular frame *c* is set in the receptacle M and adapted to turn therein, being held by two spring-clips *b' b'*, and such frame holds the diaphragm *d*, and the tube attachment *e* is screwed into said frame. Attached to the center of the diaphragm by cement or in any suitable manner is a post *e'*, from which extend two links *f*, connected with which is a lever *g*, which is also pivoted between lugs *h*, depending from the flat plate *i*, which is pivoted at *k* on the frame *c* and supported at its other end by the head of a small screw *l*.

Fixed upon the free end of the lever *g* is a cross-piece *m*, which carries the recording and reproducing points. These are preferably of the character shown and described in a previous application filed April 10, 1889, Serial No. 306,670, the recording-point having a circular gouging edge and the reproducing-point being in the form of a ball or sphere. The recording-point *n* is held in a sleeve *o* at an angle across one end of the cross-piece *m*, and the reproducing-point *p* is carried in a similar sleeve *o'*, extending directly from the face of said cross-piece.

It will be seen that by turning the collar *c* in the receptacle M either the recording-point or the reproducing-point will be brought into operative position on the phonogram-blank. As illustrated in Fig. 6, the recording-point is in contact with the surface and the reproducing-point is thrown off; but by turning the holder it will be seen that these positions will be reversed, the reproducing-point will be brought against the cylinder and the recording-point thrown out of contact therewith.

For convenience of manipulation I provide a handle *q* upon the outer ring of the holder and the receptacle M. I place a stop-pin *r* and an adjustable screw *r'* for limiting the movement of said handle and so determining the movement which may be given to the recording and reproducing points.

In order that the position of the reproducing-point may be adjusted laterally when necessary to bring it into the track of the record, I make the stop *r'* on one side adjustable. No other adjustment is required for either the recording or reproducing point, as will be explained. I place on the exterior of the diaphragm-holder a pin *s* and on the receptacle M, I place another bent pin *t*, which extends over the holder in the manner shown. I make the speaking-tube N, which fits upon the machine, with a plate *O* at its inner end, such plate having two notches *u u'* opposite each other, so that when the tube is placed on the machine with the pins *s t* in the position shown in Fig. 1 the notches *u u'* will fit over the said pins. The said pins are thus situated when the recording-point is on the cylinder, which is the time when the tube N is to be used; but when the parts are turned to bring the reproducing-point into operation

the pin *s* is moved away from its first position, so that the mouth-piece cannot be placed on the machine. I provide the ear-tube N' with a plate *O'* at its inner end, with notches *v v'* in such position as to engage the pins *s t* when the reproducer is in position. This device furnishes an indication of which point is on the cylinder, since only the proper tube for use at each time can be attached to the machine.

The outer end of the receptacle M rests upon a guide-rest P, as heretofore, and is provided, in addition to the handle Q for raising it off the record, with a pivoted handle R, having a cam-head, of which one side *p'* is square and the other side *p''* is curved. In lowering the receptacle upon the cylinder the handle R is held, together with the handle Q, so that the head is turned and the curved side *p''* reaches the guide-rest before the receptacle M and before the recording or reproducing point strikes the record. The handle R then being allowed to fall, the cam-head turns to its flat side and lets the point easily down upon the record. Raising the handle R, so as to turn the cam-head, lifts the receptacle sufficiently to raise the point off the record and disengage the nut-sections from the feed-screw, so that the forward movement of the recorder or reproducer is stopped, so as to allow the parts to be slid back to the starting position.

No adjustment for any part is required at the guide-rest, as heretofore, by reason of the provision of the weight *i*. Such weight is made such as by its pressure on the recording-point to cause the same to enter the record material to the desired depth. The material used is preferably of a hard and brittle nature. The resistance to the entrance into the material of the gouging recording-point increases the farther it enters, and when it reaches the desired depth such resistance becomes so great as to lift the weight, and the point will penetrate no farther. This is the same no matter how the size of the cylinder may be decreased by turning it off, of course within the limits for which the machine is constructed. The reproducing-point will of course go to the bottom of the record, it being adjusted laterally, if necessary, by screw *r'*. The weight *i* also serves as a retarding device, such as is described in a prior patent permitting the sound-vibrations to be transmitted to and from the diaphragm, but taking up any movements due to irregularities in the shape of the cylinder and preventing such movements from affecting the diaphragm.

By arranging the recording and reproducing points as described I am enabled to place the knife which I employ for turning off the surface of the cylinder to remove a record at a distance from the recording and reproducing points. I place it at the rear portion of the rocking holding-arm, and I arrange it so that the depth of the cut may be precisely

determined. I place the knife at the end of a stem which is constantly held forward by a spring, and I provide an adjustable stop engaging the cylinder surface, which enables the distance to which the knife is pressed forward to be altered according to the size of the cylinder, and which is swung off the cylinder by the turning movement thereof. I provide, also, a simple device for moving the knife off the cylinder and for locking the knife against the cylinder and away from it, and I so arrange this that the throwing back of the rocking holding-arm will trip such device and move the knife back, so that when the arm is lowered again to bring the recording-point into position the knife will be off the surface.

The rocking holding-arm has a rearwardly-extending projection R' , one side of which is flat, and to this is secured by screws a square guide S' , in which slides a square stem T' , which carries at its end the knife U' . Secured by a set-screw d' to said stem is the metal chute e' for conveying the shavings from the knife, the stem passing through such chute and projecting through a small hole against the cylinder, so that the material removed by the knife passes through the hole into the chute and is conveyed away from the cylinder. Pivoted on a screw g' , which passes through the guide-wall is a lever V' , which passes out through a slot k' in said guide, and whose head plays in said slot and in slot k^2 opposite it. The head of said lever has a notch h' to engage a pin i' on the stem T' and a projection l' arranged to strike the end of the slot k' . The outer end of the stem T' is cored and receives a light spring l^2 , which presses the stem and knife forward. The lever V' is of such length as to strike the back of the machine when the rocking holding-arm is thrown back.

Pivoted loosely at the side of the stem T' , between the chute and the end of the guide, is a pin m' , having a head n' adjustable longitudinally on said pin, the other end n^2 of said pin being weighted.

In operation, when it is desired to use the turning-off tool, the rocking holding-arm is lowered upon the cylinder, the head n' being adjusted so as to cause the knife to enter the cylinder to the requisite depth, the spring forcing the knife forward. The lever is then lowered into the position shown in Fig. 1, and this gives the screw a turn and sets it against the stem T' , so that such stem is held in position and prevented from moving in either direction. The revolution of the cylinder moves the head of the loose pin away from it, so that it will not injure the surface. When the turning-off operation is concluded, the handle may be tripped by hand, if desired, the same being thrown back, so as to loosen the screw, and the notch engages the pin and moves the stem T' back. The notch passes over the stem so that the edge w' rests against the pin and the edge w^2 against the lower end

of the slot k' , whereby the knife is held back and does not touch the cylinder when the rocking holding-arm is again lowered. Instead of tripping the handle by hand, if the rocking holding-arm is thrown all the way back the end of the handle will strike the back of the machine and be moved thereby, so as to lock the knife in its rearward position, as explained. During the turning-off operation the diaphragm-handle may be turned to its middle position, so that both the recording-point and the reproducing-point will be removed from the surface, or of course, if desired, a new record may be made while the old one is being removed.

Another improvement is in the clamping device for the swinging arm at the end of the cylinder. This consists in the use of a spring for holding said arm in place. The arm is represented at S , being pivoted at T , and the clamping device is pivoted, as heretofore, at w and enters from below a slot in the end of the arm S . The head x for moving the clamping device has heretofore been made adjustable, so as to be screwed up against the arm S . I now provide the clamping device with a sliding sleeve y , containing a stationary spring z , which, when the clamping device is raised, holds the sleeve y against the arm S and locks the parts without any further movement on the part of the operator.

What I claim is—

1. In a phonograph, the combination, with a diaphragm, of a recording-point and a separate reproducing-point connected therewith and adapted to be brought alternately into operative relation with the same surface, substantially as set forth.

2. In a phonograph, the combination, with a diaphragm, of a recording-point and a separate reproducing-point connected with said diaphragm on the same side thereof, substantially as set forth.

3. In a phonograph, the combination, with a diaphragm, of a recording-point and a reproducing-point connected therewith and means for moving said points so as to bring either of them into operative position with relation to the same surface, substantially as set forth.

4. In a phonograph, the combination of a diaphragm, an arm connected therewith, and a recording-point and reproducing-point attached to said arm at different angles, substantially as set forth.

5. In a phonograph, the combination of a diaphragm supported so as to have a turning movement and a recording-point and reproducing-point carried thereby at different angles, substantially as described.

6. In a phonograph, the combination of a diaphragm set in a movable frame and a recording-point and a reproducing-point connected therewith and adapted by the movement of said frame to be brought alternately into operative relation to the same surface, substantially as set forth.

7. In a phonograph, the combination of a receptacle, a diaphragm held movably in said receptacle, a handle connected with said diaphragm, and a recording-point and a reproducing-point carried by said diaphragm, substantially as set forth.
8. In a phonograph, the combination of a diaphragm, an arm pivotally connected with said diaphragm, a cross-piece on said arm, and a recording-point and reproducing-point carried at the ends of said cross-piece, respectively, substantially as set forth.
9. In a phonograph, the combination of a diaphragm, an arm pivotally connected with said diaphragm, a cross-piece on said arm, a recording-point held at an angle across one end of said cross piece, and a reproducing-point extending from the face of said cross-piece at its other end, substantially as set forth.
10. In a phonograph, the combination of the diaphragm, the recording and reproducing points connected with said diaphragm, and a retarding device common to both points, substantially as set forth.
11. In a phonograph, the combination of a diaphragm, a lever connected therewith, separate recording and reproducing points carried by said lever, and a retarding device for said lever, substantially as set forth.
12. In a phonograph, the combination of a diaphragm, a recording-point and a reproducing-point connected therewith, and a loose weight pressing upon said points, substantially as set forth.
13. In a phonograph, the combination of a diaphragm, a lever connected therewith, a recording-point and a reproducing-point attached to said lever, and a loose weight pressing upon said lever, substantially as set forth.
14. In a phonograph, the combination, with the turning diaphragm carrying both the recorder and the reproducer, of the guides for determining the position of the speaking-tube and ear-tube, substantially as set forth.
15. In a phonograph, the combination of the receptacle, the annular frame turning therein, the diaphragm held by said frame, the recording and reproducing points connected with the diaphragm, the guide-pin on the turning frame, the guide-pin on the stationary receptacle, and the speaking-tube and ear-tube having notches differently situated, substantially as set forth.
16. In a phonograph, the combination of the feed-screw, the movable part carrying the recorder and reproducer, and the divided feeding-arm engaging said feed-screw, substantially as set forth.
17. In a phonograph, the combination of the feed-screw, the movable part carrying the recorder and reproducer, and the split spring carrying the nut-sections engaging said feed-screw, substantially as set forth.
18. In a phonograph, the combination of the pivoted holder carrying the recorder and reproducer, the guide-rest, and the pivoted handle for said holder, having a cam-head, substantially as set forth.
19. In a phonograph, the combination of the rocking holding-arm carrying the recorder and reproducer, the feed-screw, the traveler-arm connected with the rocking holding-arm and engaging said feed-screw, and the pivoted handle for the rocking holding-arm, having a cam-head engaging said guide-rest, substantially as set forth.
20. In a phonograph, the combination of the turning-off knife, the guide in which said knife slides, and the spiral spring within said guide behind said knife for pressing said knife forward, substantially as set forth.
21. In a phonograph, the turning-off knife, in combination with a spring for pressing the same forward and the adjustable pivoted stop for limiting the forward movement, substantially as set forth.
22. In a phonograph, the combination of the turning-off knife, a spring for pressing the same forward, and a clamp for locking the same in position, substantially as set forth.
23. In a phonograph, the combination of the guide, the knife-stem sliding in said guide, a clamp for locking said stem in any position, and a handle for moving said clamp, substantially as set forth.
24. In a phonograph, the combination of the guide, the knife-stem sliding therein, a clamp for holding said stem in position, and means for releasing said clamp, operated by a movement of the rocking holding-arm, substantially as set forth.
25. In a phonograph, the combination of the rocking holding-arm, the turning-off knife sliding through a guide on said arm, the clamp for locking said knife, and a projection from said clamp, adapted to strike the back of the machine when the arm is thrown back, substantially as set forth.
26. In a phonograph, the combination of the slotted guide, the knife-stem sliding therein, and the locking and releasing handle for said stem, projecting through said slot, substantially as set forth.
27. In a phonograph, the combination of the slotted guide, the knife-stem sliding therein, and the pivoted handle having a cam-head for moving said stem, substantially as set forth.
28. In a phonograph, the combination of the guide, the knife-stem sliding therein, the set-screw adapted to set against the stem, and the handle pivoted on said screw for moving said stem, substantially as set forth.
29. In a phonograph, the combination, with the turning-off knife, of the conveying-chute supported upon said knife, substantially as set forth.
30. In a phonograph, the combination of a conveying-chute and a turning-off knife passing through said chute, and with its edge projecting through an aperture in said chute, substantially as set forth.
31. In a phonograph, the combination of the

movable diaphragm carrying both the recording-point and the reproducing-point, and the stops limiting the movement of said diaphragm, substantially as set forth.

- 5 32. In a phonograph, the combination of the movable diaphragm carrying both the recording-point and the reproducing-point, and the stops limiting the movement of said diaphragm, the stop which controls the movement for throwing in the reproducing-point
10 being adjustable, substantially as set forth.

33. In a phonograph, the combination of the recording-point and reproducing-point carried by the same diaphragm, means for moving said points so as to bring either of them
15 into operative position, and means for adjusting the position of the reproducing-point laterally to the record, substantially as set forth.

34. In a phonograph, the combination, with
20 the movable diaphragm, and the holder carrying the recording-point and reproducing-point,

of the spring-clips for holding the same in place, substantially as set forth.

35. In a phonograph, the combination of a gouging recording-point and a spherical reproducing-point carried by the same diaphragm, substantially as set forth. 25

36. In a phonograph, the combination of a cutting recording-point and a blunt reproducing-point carried by the same diaphragm, substantially as set forth. 30

37. In a phonograph, the combination, with the swinging arm for holding the cylinder in place, of the spring-lock for said arm, substantially as set forth. 35

This specification signed and witnessed this 14th day of November, 1889.

THOS. A. EDISON.

Witnesses:

D. H. DRISCOLL,
WILLIAM PELZER.

(No Model.)

T. A. EDISON.
PROCESS OF DUPLICATING PHONOGRAMS.

No. 484,582.

Patented Oct. 18, 1892.

FIG. 1

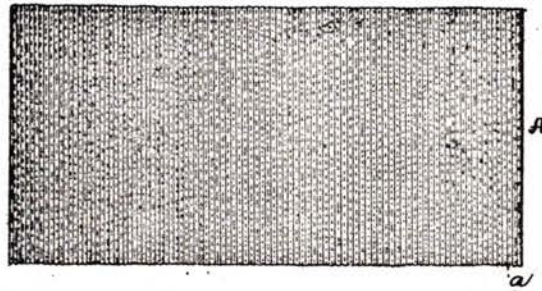


FIG. 2.

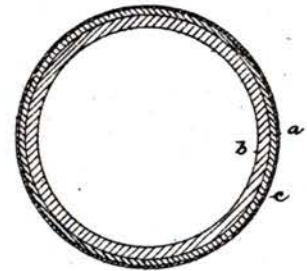


FIG. 3.

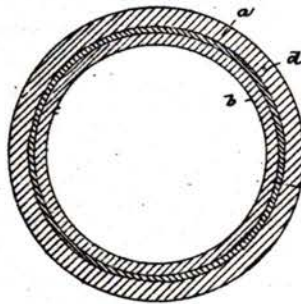


FIG. 4.

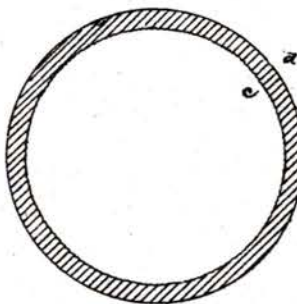


FIG. 5.

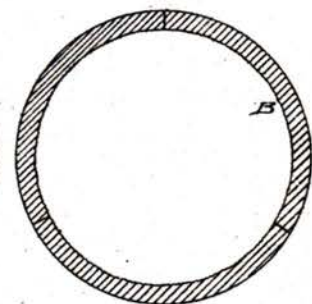


FIG. 6.

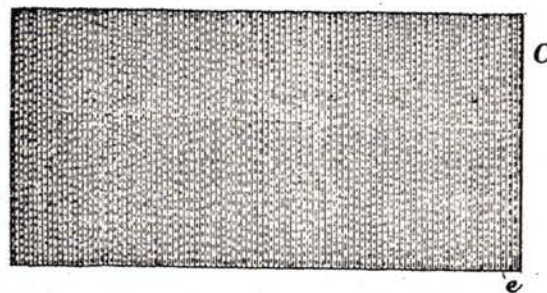
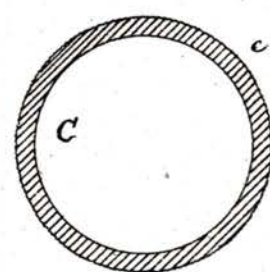


FIG. 7.



Witnesses
Ed. Howard /
William R. Rye

Inventor
Thomas A. Edison,
By his Attorney Dyer & Seely

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO
THE EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 484,582, dated October 18, 1892.

Original application filed January 5, 1888, Serial No. 259,895. Divided and this application filed January 30, 1888. Renewed March 30, 1892. Serial No. 427,011. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain
5 new and useful Process for Duplicating Phonograms, (Case No. 751,) of which the following is a specification.

The object I have in view is to produce a practical process for the duplication of phonographic records, so that the new art of phonographic publication can be established. Generally I propose to construct a suitable matrix, preferably in metal, and by its use mold duplicate phonograms with the phonographic records thereon, such phonograms or
15 the surface thereof being preferably constructed of a material too hard for the satisfactory indentation thereof by the phonograph-recorder; but the duplicate phonograms may be made of a softer material. For
20 the construction of the matrix I employ the process of vacuum deposit described in my application, Serial No. 118,942, filed January 28, 1884. The original phonogram is preferably
25 constructed with a surface of wax or a similar material. This is placed in a suitable phonograph and the phonographic record produced thereon. The phonogram so impressed with the phonographic record is placed in a high vacuum, in which an electric arc, continuous or
30 discontinuous, is produced between electrodes of metal or in which metal vapor is otherwise produced. The electric arc produces a vapor of the metal of which the electrodes are composed, which vapor or a metallic vapor otherwise
35 produced within said chamber is deposited on the indented surface of the phonogram, forming a layer of metal thereon, which follows accurately all the indentations of the record, however minute, owing to the highly-communited condition of the metal deposited. The phonogram while the deposit is taking
40 place in the vacuum-chamber is revolved slowly by a suitable power-connection, and this is especially necessary when the form of the phonogram is cylindrical, which it preferably is. The vacuum deposit is continued until the layer of metal is sufficiently thick, when the covered phonogram is removed
45 from the vacuum-chamber and is further

covered by a more rapid process to give strength and body to the covering. A further covering of metal may be produced by electroplating a metal upon the vacuum deposit in the usual manner of electroplating, or the vacuum deposit may be backed up by
55 casting upon it type-metal or other metal or alloy having a lower fusing-point than the vacuum deposit, or this may be done after electroplating upon the vacuum deposit, or the vacuum deposit may be backed up by a
60 cement or gum or by plaster-of-paris; but a metal backing is preferred. The material of the original phonogram is then dissolved off of the metal covering, leaving in the case of
65 cylindrical phonograms a hollow metal cylinder or one internally faced with metal, carrying the phonographic record in relief upon its inner surface. This metal cylinder is then split longitudinally by a very thin saw into a number of parts—say, for illustration, three parts—
70 which are suitably mounted upon levers, so that a mold is formed, which can be closed to receive the material to be molded and opened to permit of its being taken out. The duplicate phonograms are produced by means of
75 this mold by pouring therein and preferably around a suitable core placed in the mold suitable substances, such as wax or wax-like material, resin, or plaster-of-paris, the material
80 being preferably too hard to be satisfactorily indented by the phonograph, or the duplicate phonograms may be made by taking sheets of smooth material, like waxed paper or tin-foil, and pressing them upon the surface of
85 the mold by a plunger or otherwise, the sheets being afterward backed up by a wax, resin, or cement. The latter way of making the duplicate phonograms is especially applicable to flat-surface phonograms, although it may
90 be used for phonograms with cylindrical surfaces. The production of the first layer of metal upon the phonograph-record by means of the vacuum deposit has great advantages over doing this by electroplating. In electroplating the wax-surface must first be covered
95 by plumbago or gold-leaf or silver salts reduced by chemical reagents in order to form a conducting basis for the plating. The plumbago and gold-leaf do not bring out the fine
100

vibrations and produce rough reproductions while the silver salts do not run well on the wax surface. The vacuous deposit, however, adheres uniformly to the wax surface and reproduces the record with great perfection.

The invention is illustrated for convenience in connection with a cylindrical phonogram.

In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of an original phonogram; Fig. 2, a cross-section of the original phonogram with a thin vacuous deposit thereon; Fig. 3, a view similar to Fig. 2, with a further backing; Fig. 4, a view the same as Fig. 3, with the original phonogram dissolved out; Fig. 5, a sectional view of the divided mold or matrix; Fig. 6, an elevation of a duplicate phonogram produced by the mold, and Fig. 7 a cross-section of such duplicate phonogram.

A is the original phonogram, having a relatively-soft wax or wax-like surface *a* and the backing of harder material *b*, or it may be entirely of wax. The phonographic record is produced upon the surface *a*. The metallic vacuous deposit is shown at *c*, and the further backing, preferably of metal, is shown at *d*.

B is the divided mold, produced as has been stated and having the phonographic record in relief.

C is the duplicate phonogram, produced by the mold and having a surface *e*, indented with the phonographic record and preferably of harder material than could be practically or satisfactorily indented directly by the phonograph.

My invention herein is limited to constructing the matrix or mold by covering the phonograph-record by a vacuous deposit.

The broad invention of duplicating phonograph-records and of producing matrices for that purpose, not limited to the use of the vacuous deposit as a step in the process of reproducing the phonographic record or constructing a matrix for that purpose, is not claimed herein, such broad subject-matter being covered by an application for patent filed

by me January 5, 1888, Serial No. 259,895, of which this specification is a division.

What I claim is—

1. The process of forming a matrix or mold for the duplication of phonographic records, consisting in covering the phonograph-record with a deposit of metal by vaporizing metal in a vacuum in which the record is placed, substantially as set forth.

2. The process of forming a matrix or mold for the duplication of phonographic records, consisting, first, in indenting the original record on a phonogram; second, covering the recording-surface of such phonogram with a deposit of metal by vaporizing metal in a vacuum in which such phonogram is placed, backing up such deposit to give it strength, and then removing the original phonogram, substantially as set forth.

3. The process of forming a matrix or mold for the duplication of phonographic records, consisting, first, in indenting the original record upon a phonogram having a wax-like surface; second, covering the recording-surface of such phonogram with a deposit of metal by vaporizing metal in a vacuum in which such phonogram is placed, backing up such deposit to give it strength, and then removing the original phonogram, substantially as set forth.

4. The process of duplicating phonograms carrying a phonographic record, consisting, first, in indenting the original record upon a phonogram; second, constructing a matrix or mold of such original record by depositing thereon a coating of metal by vaporizing metal in a vacuum in which the record is placed, and, third, producing duplicate phonograms from such matrix, substantially as set forth.

This specification signed and witnessed this 17th day of January, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,
E. C. ROWLAND.

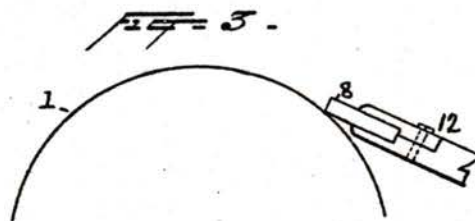
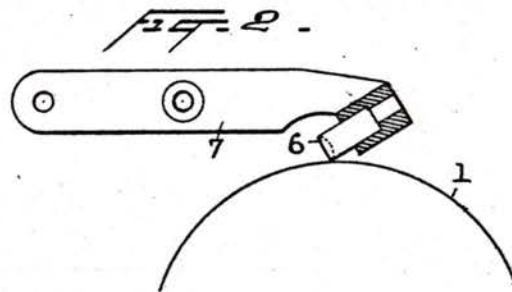
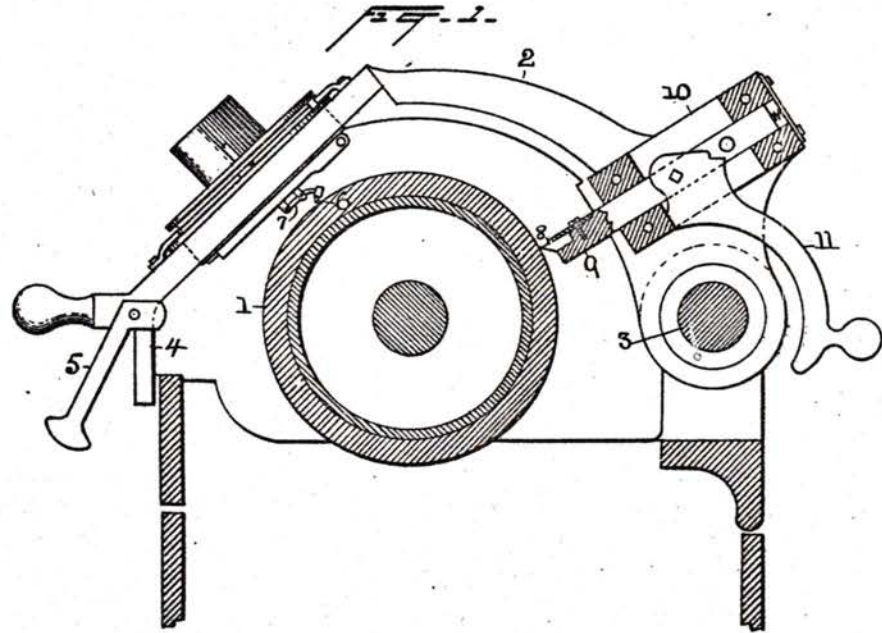
1258

(No Model.)

T. A. EDISON.
PHONOGRAPH CUTTING TOOL.

No. 484,583.

Patented Oct. 18, 1892.



Witnesses
Thomas A. Clark.
Charles M. Catlin.

Inventor
T. A. Edison.
By his Attorneys
Lyert Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH CUTTING-TOOL.

SPECIFICATION forming part of Letters Patent No. 484,583, dated October 18, 1892.

Application filed May 27, 1890. Renewed March 30, 1892. Serial No. 427,012. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Phonograph Cutting-Tools, (Case No. 861,) of which the following is a specification.

In practice it is found that after phonographs have been in use for a time the articulation of the speech reproduced is not so smooth and clear as when the phonograph was first put in use. While the articulation is sufficiently good to be intelligible, the false or extraneous vibrations are such as to cause unpleasant and sometimes confusing noises at the reproducer. I attribute this to the fact that by continued use the cutting-edge of the recorder and of the turning-off tool and the bearing point or end of the reproducer become roughened and this causes false marks to be made on the phonogram-blank. The recording-surface of the phonogram-blank is ordinarily of wax or a stearate or hard metallic soap or other wax-like material or composition, and it would naturally be supposed that a tool of steel of the best quality would be entirely satisfactory for use in connection with such a comparatively-soft substance. I have, however, found that such tools are subject to the objection above set forth. This is due to the chemical action of acids or other substances found in the wax-like material or composition of which the phonogram-blank is made and to the dulling and roughening action of fine particles of silica or other hard material which become mixed with the wax-like material during the manufacture of the blank or which become lodged on the surface thereof. After many trials I have found that a sapphire or other similar jewel co-operates in the most effective manner with the wax-like phonogram-blank since the acids thereof do not attack these substances, they are not rusted by moisture, and they are adapted to withstand the dulling action of the hard particles referred to.

The present invention consists in a cutting-tool (which may be either the recording-point or the turning-off tool) for a phonograph of a jewel or similar substance which will withstand the corroding action of acid and in cer-

tain combinations which will be hereinafter described and claimed.

The reproducer is not claimed herein, since it forms the subject of another application filed on even date herewith.

In the accompanying drawings, which illustrate the invention, Figure 1 is a side view, partly in section, of a phonograph of well-known form with the improved cutting-tools attached. Fig. 2 shows the recorder on a larger scale, and Fig. 3 is a view of a turning-off tool of slightly-different shape from that illustrated in Fig. 1.

1 is the wax-like phonogram-blank, mounted on a cylinder in the ordinary manner.

2 is the arm carrying the recorder and sleeved onto the guide-rod 3 and movable thereon.

4 is the guide-rest, on the upper edge of which the recorder-frame bears and along which it slides.

5 is a cam-lever for raising the frame and thereby removing the recorder from the surface of the blank.

6 is the recorder, preferably of sapphire, as above described. In the form shown the recorder is in the shape of a cylinder, the outer end being hollowed out, thus leaving a curved sharp edge for cutting the surface of the blank. This particular form does not constitute a part of the present invention, since it is claimed in my application, Serial No. 306,670, dated April 10, 1889. This cutting-tool is mounted in a socket or sleeve at one end of the pivoted lever 7, the opposite end of which is connected to the phonograph-diaphragm.

8 is a cutting-tool, which is technically termed the "turning-off" tool, and which is used for removing a previous record and for giving a smooth and even surface to the blank on which to impress a new record. This tool is also made of sapphire or of quartz, agate, or similar hard material not readily affected by the acids. In the construction shown it is clamped to the carrier 9, which is movable in the holder 10, and 11 is a handle for moving the cutting-tool onto or off from the surface of the blank.

I have found that a turning-off tool which does not have a sharp cutting-edge, but has such edge ground away to form a right angle or approximately a right angle, so that the

edge will not enter beneath the surface of the material, can be used to advantage. As such an edge cuts the material, it breaks it above the cutting-edge, so that the chips do not
5 carry with them any portion of the blank below the line of cutting. This form of turning-off tool is illustrated in Fig. 3, where 8 is the sapphire cutting-tool supported in the clamp 12. This tool is supported, as indicated,
10 so as to present its cutting-edge obliquely to the surface of the phonogram-blank.

Having thus described my invention, what I claim is—

1. In a phonograph employing phonogram-
15 blanks of wax-like material, and in combination with a holder for such blanks, a jewel

cutting-tool situated with relation to said holder, so as to operate upon the blank held thereby, substantially as set forth.

2. The combination, in a phonograph, with
20 a phonogram-blank of comparatively-soft material, of a jewel recorder, substantially as described.

3. The combination, in a phonograph, with
25 a phonogram-blank of a wax-like material, of a sapphire recorder, substantially as set forth.

This specification signed and witnessed this 24th day of May, 1890.

THOS. A. EDISON.

Witnesses:

A. O. TALE,

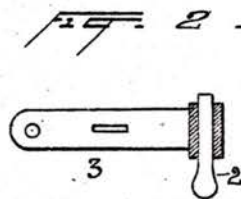
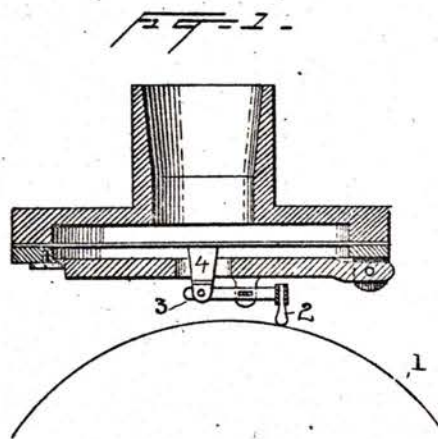
THOMAS MAGUIRE.

1261

T. A. EDISON.
PHONOGRAPH REPRODUCER.

No. 484,584.

Patented Oct. 18, 1892.



Witnesses
Stonnes A. Black
Charles M. Cathin.

Inventor
T. A. Edison.
By his Attorneys
Lyert Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 484,584, dated October 18, 1892.

Application filed May 27, 1890. Renewed March 30, 1892. Serial No. 427,013. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonograph-Reproducers, (Case No. 862,) of which the following is a specification.

In practice it is found that after phonographs have been used for a time the articulation of the speech reproduced is not so smooth and clear as when the phonograph was first put in use. While the articulation is sufficiently good to be intelligible, the false vibrations are such as to cause unpleasant and some times confusing noises at the reproducer. I attribute this to the fact that by continued use the cutting-edge of the recorder and of the turning-off tool and the bearing point or end of the reproducer become roughened. The recording-surface of the phonogram-blank is ordinarily of wax or a stearate or hard metallic soap or other wax-like material or composition, and it would naturally be supposed that a tool of steel of the best quality would be entirely satisfactory for use in connection with such a comparatively-soft substance. I have, however, found that such tools are subject to the objection above set forth. This is due to the chemical action of acids or other substances found in the wax or composition of which the phonogram-blank is made, and to the dulling and roughening action of fine particles of silica or other hard material which become mixed with the wax during the manufacture of the blank or which become lodged on the surface thereof. After many trials I have found that hard crystals, earthy oxides, and gems—such, for example, as sapphire, quartz, or garnet, all of which may be termed “jewels”—co-operate in the most effective manner with the wax-like phonogram-blank, since the acids thereof do not attack them, they are not rusted by moisture, and they are adapted to withstand the dulling action of the hard particles referred to.

The present invention consists, in a reproducer for phonographs, of a jewel possessing the characteristics above mentioned.

The recorder and turning-off tool are not claimed herein, since they form the subject-matter of an application filed by me on even date herewith.

In the accompanying drawings, which illustrate the invention, Figure 1 is a view of the reproducer bearing on the surface of a phonogram-blank. Fig. 2 is a detached view, on a larger scale, of the reproducer.

1 is the surface of the phonogram-blank.

2 is the jewel reproducing-point, the bearing end of which is preferably spherical or rounded. This jewel is held in any suitable manner at one end of the pivoted lever 3, the opposite end of which is connected to the phonograph-diaphragm by means of the post 4.

Reproducing-points made as above described not only are more durable than those of metal, but they move more readily over the record and do not introduce false vibrations into sounds reproduced.

Having thus described my invention, what I claim is—

1. The combination, in a phonograph, with a phonogram-blank of wax-like material, of a jewel reproducer, substantially as described.

2. The combination, in a phonograph, with the phonogram-blank, of a rounded jewel reproducer, substantially as described.

3. A reproducer or bearing-point for phonographs, consisting of a jewel not affected by chemicals or chemical action of the wax-like material of the phonogram-blank, substantially as described.

This specification signed and witnessed this 24th day of May, 1890.

THOS. A. EDISON.

Witnesses:

A. O. TATE,
THOMAS MAGUIRE.

1263

(No Model.)

T. A. EDISON
PHONOGRAPH.

No. 484,585.

Patented Oct. 18, 1892.

Fig. 1.

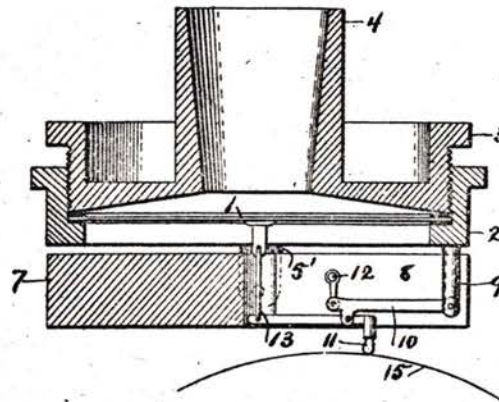
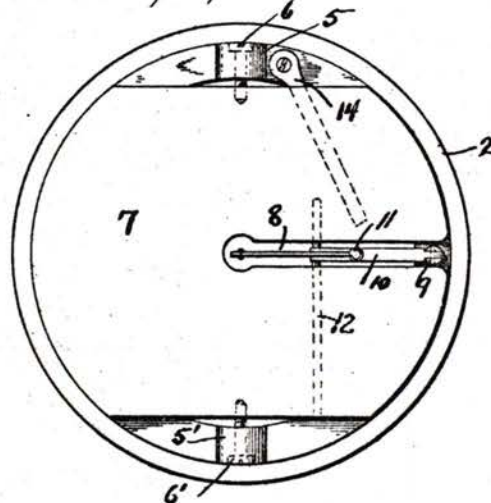


Fig. 2.



Witnesses
Korvis J. Clark
W. E. Ryan

Inventor
T. A. Edison,
By his Attorney,
Lyert Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 484,585, dated October 18, 1892.

Application filed July 30, 1890. Renewed March 30, 1892. Serial No. 427,014. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 865,) of which the following is a specification.

The present invention relates to a weight or retarding device on which the operating-point (recorder or reproducer) of a phonograph is carried, and to which it is connected by a pivotal or jointed connection in a well-known or any suitable manner.

The invention consists mainly in a support for the operating-point in the form of a balanced block or plate, and in certain features of construction and combinations in connection therewith, as hereinafter described and claimed.

The device is an improvement on the form heretofore employed, in which the weight supporting the operating-point was pivoted at one edge and was therefore not balanced. I have found that by having the weight balanced, and more especially by having it slightly overbalanced on the side at which the point is attached, increased efficiency of operation is attained.

In the accompanying drawings, which illustrate the invention, Figure 1 is a cross-section of a phonograph-reproducer embodying the improvement, and Fig. 2 is an inverted plan of the same.

The phonograph-diaphragm 1 is supported between the ring 2 and the adjustable ring 3 with elastic or yielding washers or cushions around its edge in the usual manner.

4 is a tubular extension, to which a hearing-tube may be connected. From the ring 2 extend two posts 5 5' at diametrically-opposite points. These posts are perforated for the reception of pivot-screws 6 6', between which is hung the counterbalanced weight or retarding device 7, which is a plate or block of metal or other suitable material. In the plate or block 7 is a slot 8, extending from one edge of the block to the center. From ring 2 a post 9 extends into or in line with the slot, and to this post is pivoted a lever 10, to which the operating-point of the phonograph (here shown as a reproducing-point) is

pivotaly connected. A link connects lever 10 to the pin 12 and a link 13 connects the diaphragm to the operating-point.

As before indicated, it is preferable to give the retarding device a slight bias toward the phonogram-blank 15 on that side of the axis which carries the operating-point. In the instrument illustrated a spring 14 is supported on the lower edge of ring 2 and presses downwardly on plate 7 for the purpose of thus counterbalancing or overbalancing said plate. This may, however, be done in other ways, as by pivoting the plate at one side of its center of gravity or by adding a weight on one side of the pivot.

The operation of the apparatus above described is as follows: When the phonogram-blank is turned in the ordinary manner, the operating-point follows the phonogram-record and transmits the same to the diaphragm without appreciably moving weight 7, owing to the fact that it has sufficient mass to give it considerable inertia; but should there be any large irregularity in the surface of the phonogram-blank, the weight will be tilted by means of the operating-point, pivot 12, and intermediate parts, thus avoiding false and disturbing movements of the diaphragm.

The advantage of pivoting the retarding device adjacent to its center of gravity instead of pivoting it at one edge, as heretofore, is that the weight of the plate or a greater part thereof is removed from the operating-point, while at the same time the inertia of the weight holds the supporting-pivot of the operating-point stationary during normal operation of the instrument and allows said pivoted and connected parts to move when necessary, as above described.

It will be evident that with this arrangement of the several elements described the instrument may be used readily in other positions than a horizontal with equally-good results.

The shape and location of the spring and several of the other elements may be varied to some extent without departing from the invention.

Having thus fully described the invention, what I claim is—

1. In a phonograph, the combination, with a diaphragm suitably supported, of an oper-

ating-point connected therewith and supported on a weight pivoted adjacent to its center of gravity, substantially as described.

2. In a phonograph, the combination, with a diaphragm suitably supported, of an operating-point connected therewith and supported on a plate or block pivoted adjacent to its center of gravity and means for overbalancing the plate, substantially as described.

3. The combination, in a phonograph, of a diaphragm, a reproducer connected therewith, and a counterbalanced plate or block on which said reproducer is supported, substantially as described.

4. In a phonograph, the combination, with a diaphragm, of an operating-point connected therewith, the weight pivoted adjacent to its center of gravity and slotted at one side of

the center, a pin carried by the weight, and a link connection between the pin and operating-point, substantially as described.

5. In a phonograph, the combination, with a diaphragm, of an operating-point connected therewith, the weight pivoted adjacent to its center of gravity and slotted at one side of the center, a compensating spring, a pin carried by the weight, and a link connection between the pin and operating-point, substantially as described.

This specification signed and witnessed this 5th day of July, 1890.

THOMAS A. EDISON.

Witnesses:

E. COURAN,
W. PELZER.

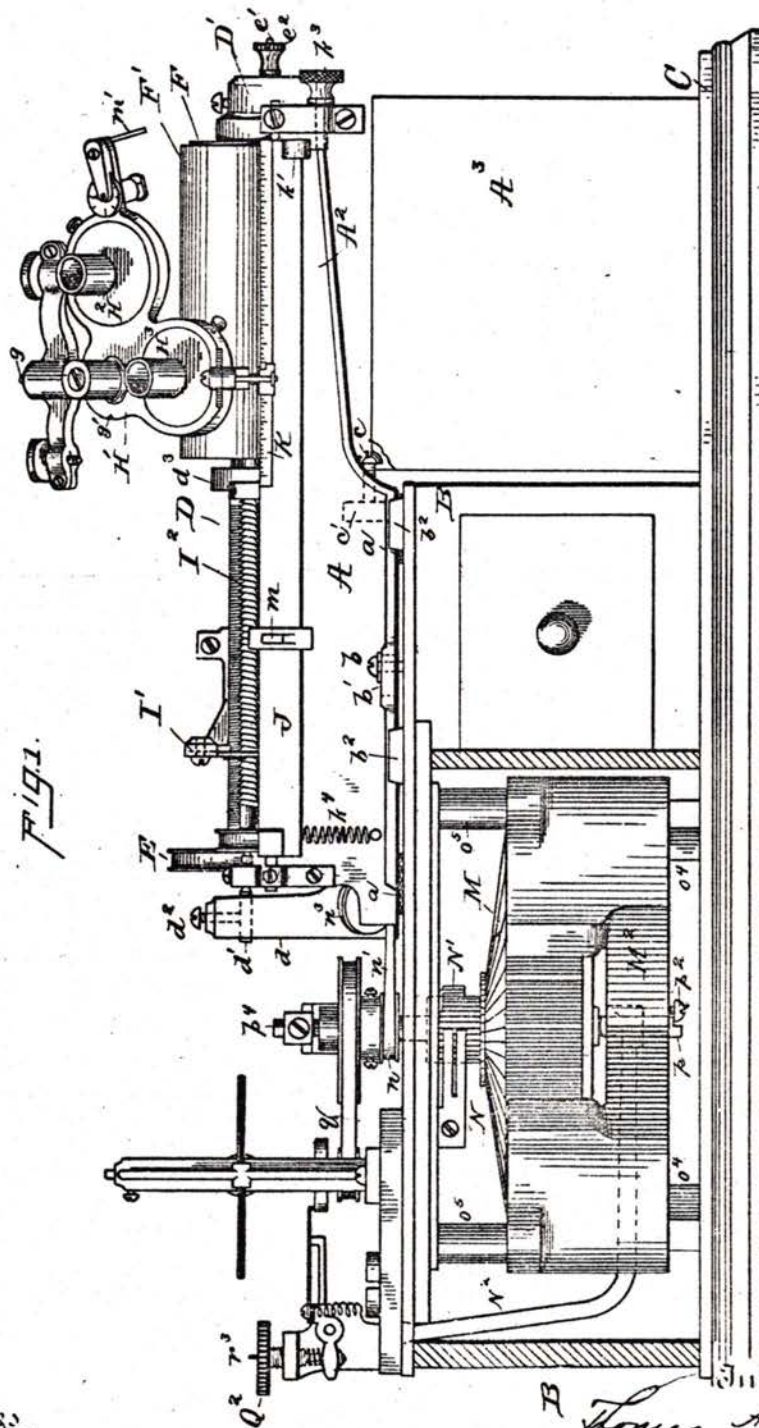
(No Model.)

7 Sheets—Sheet 1.

T. A. EDISON
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



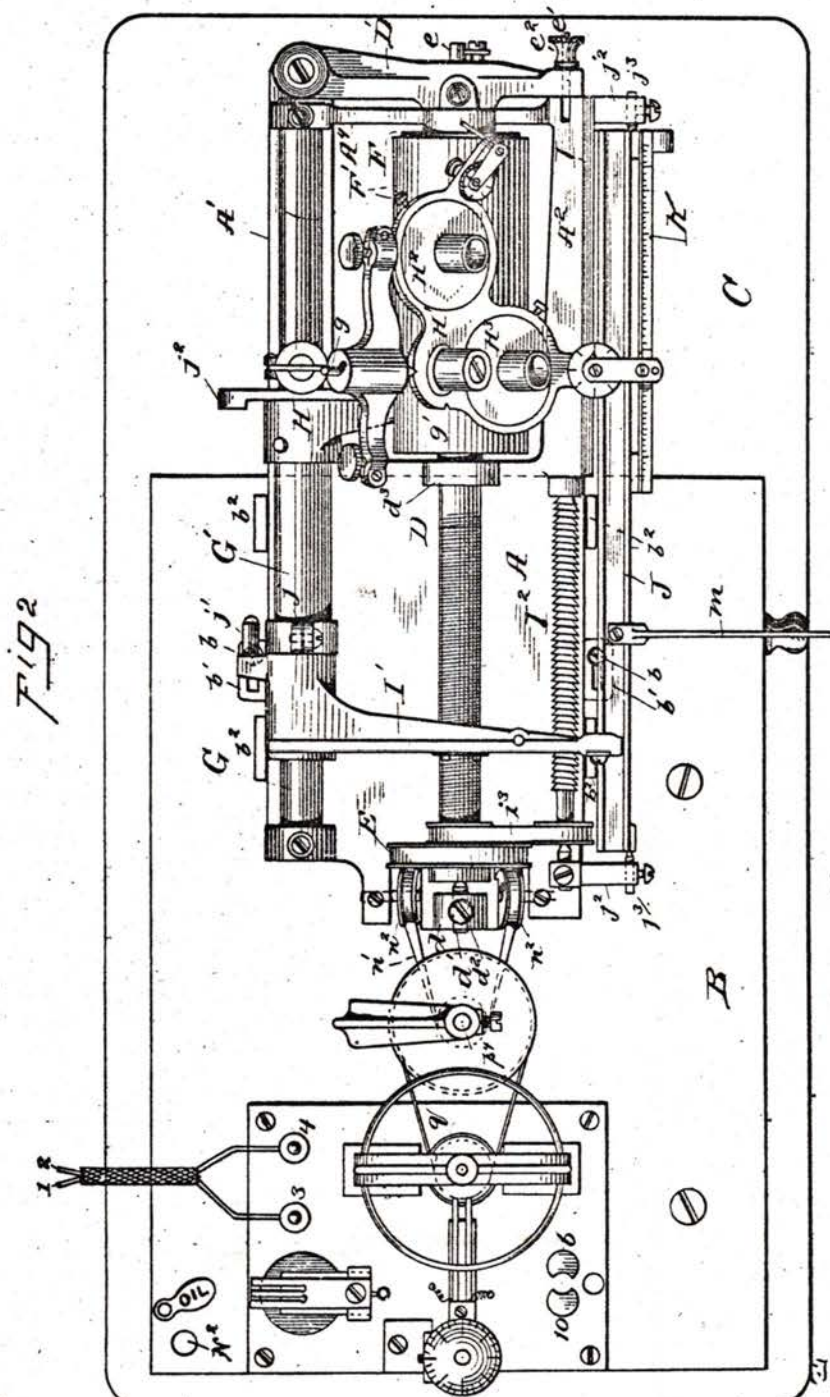
Witnesses
Ed. Rowland
William Pizer

Inventor
T. A. Edison
 By his Attorneys
Dyer & Selig

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



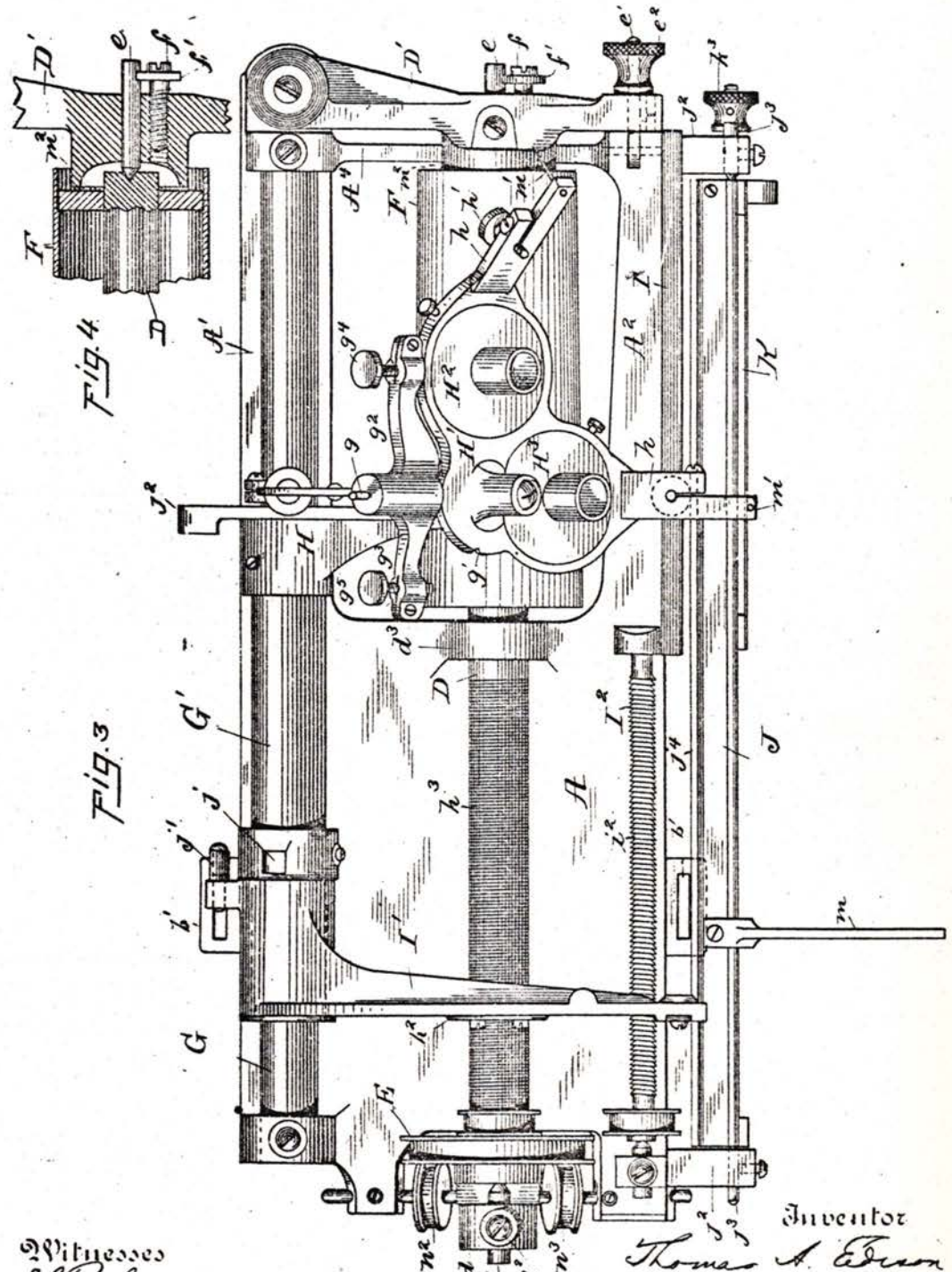
Witnesses
E. S. Rowland
William Rizer

Inventor
Thomas A. Edison
 By his Attorneys
J. P. & S. C. [illegible]

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



Witnesses
E. B. Rowland
William A. Rizer

Inventor
Thomas A. Edison
 By his Attorney
Dyer & Leely

1269

(No Model.)

7 Sheets—Sheet 4.

T. A. EDISON
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.

FIG. 5.

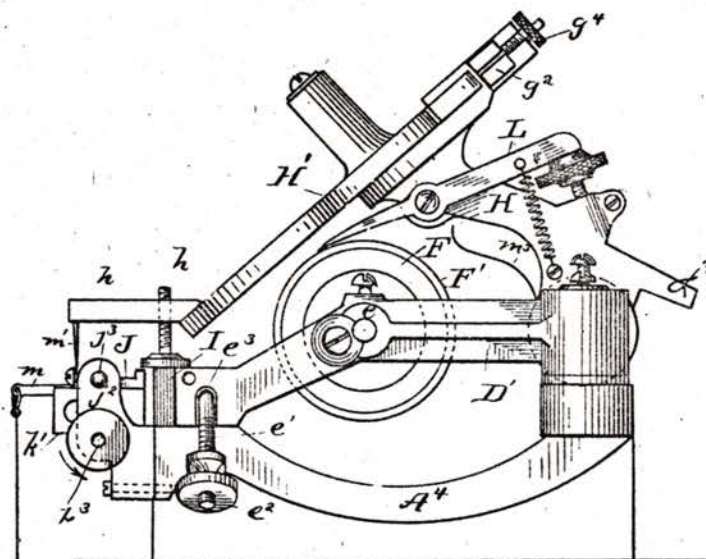
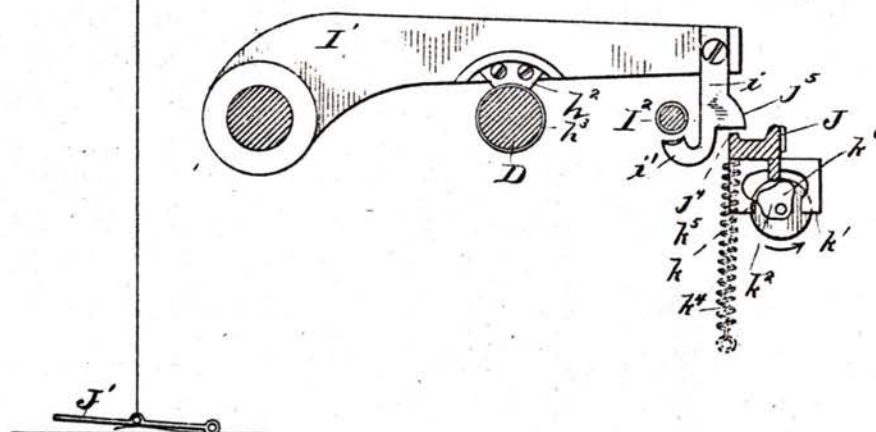


FIG. 6.



Witnesses
E. Rowland
William P. Rizer

Inventor
Thomas A. Edison.
By his Attorney
S. J. & S. L.

1270

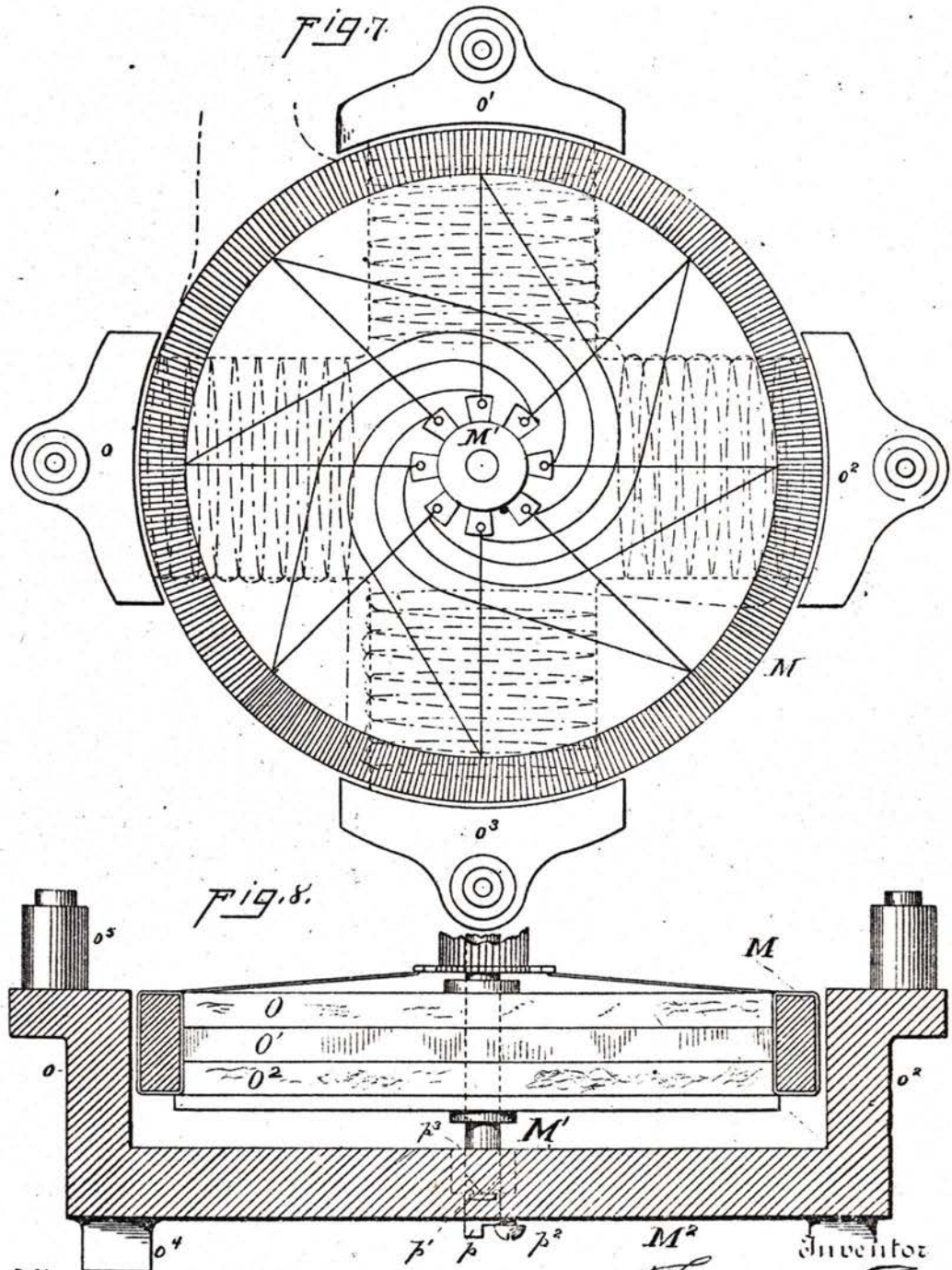
(No Model.)

7 Sheets—Sheet 5.

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



Witnesses
Ed. Rowland
William Rizer

Inventor
Thomas A. Edison.
By his Attorney—
Dym & Leach

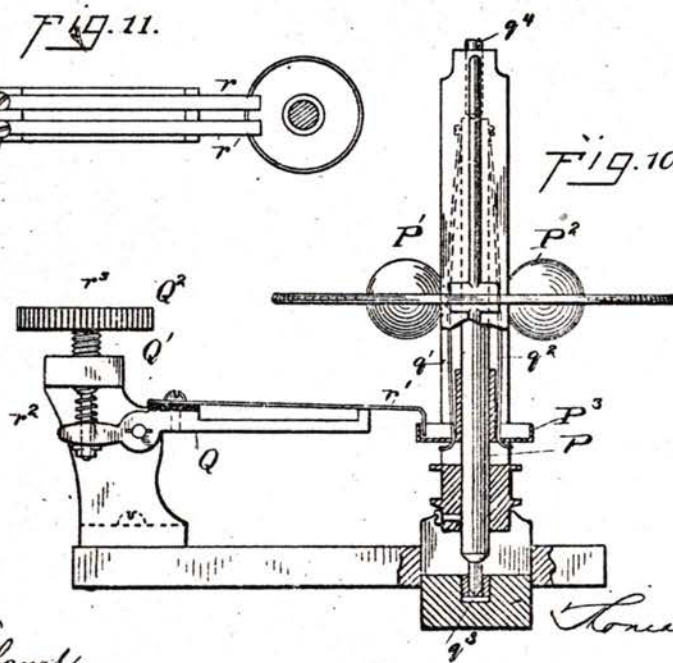
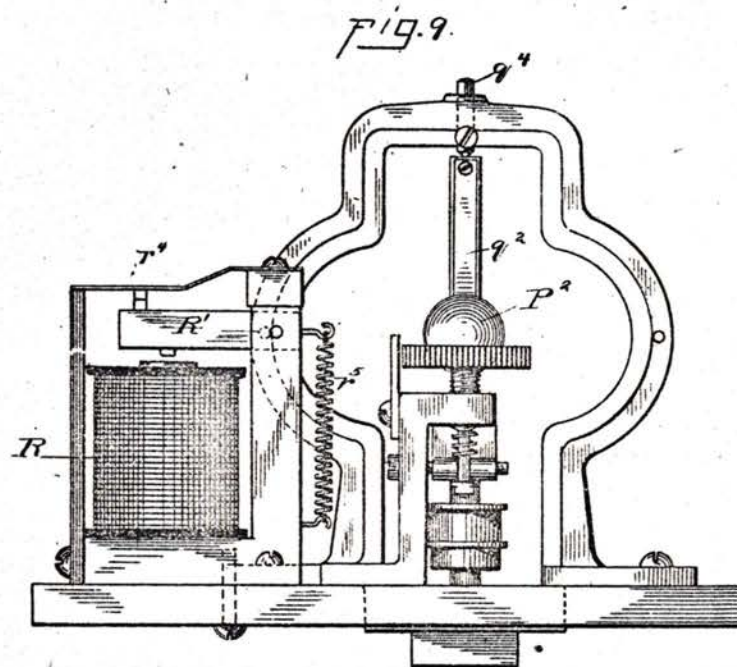
No Model.)

7 Sheets—Sheet 6.

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.



Witnesses
Ed. Rowland.
William Rizer

Inventor
Thomas A. Edison
 By his Attorneys *Dyer & Seely*

1271

(No Model.)

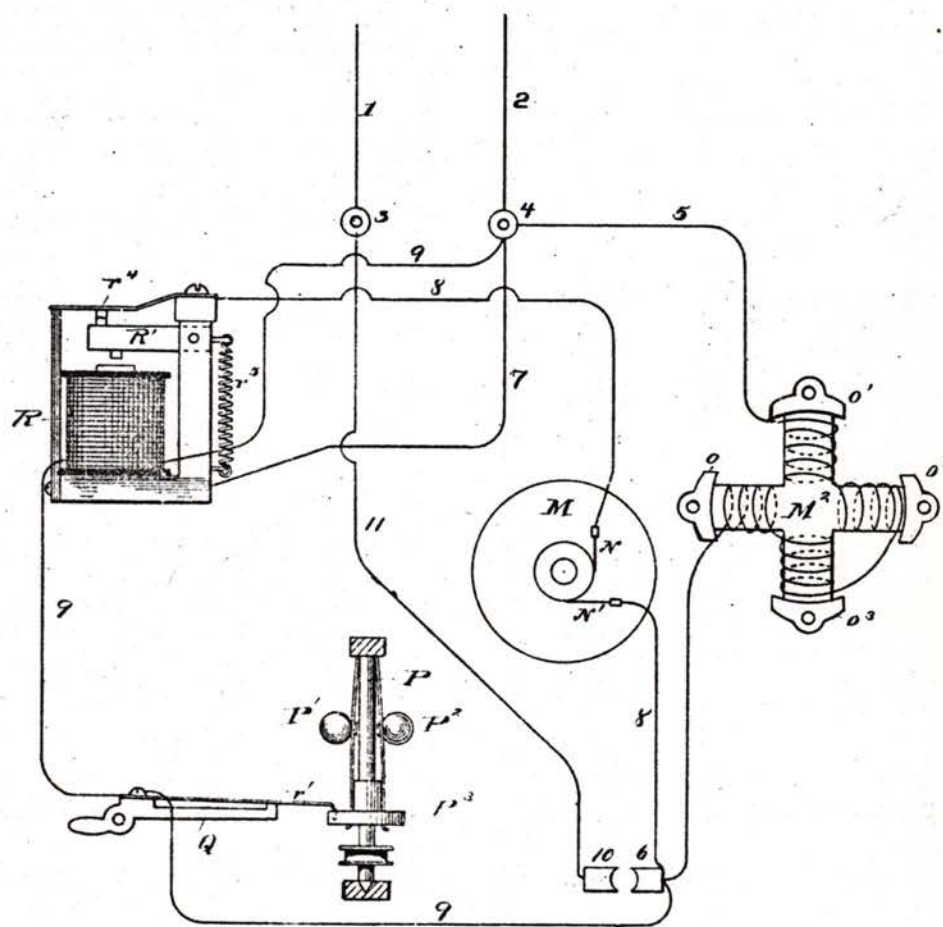
7 Sheets—Sheet 7.

T. A. EDISON.
PHONOGRAPH.

No. 499,879.

Patented June 20, 1893.

Fig. 12.



Witnesses
E. C. Crawford
William E. Egan

Inventor
Thomas A. Edison.
By his Attorneys
Dye & Selig.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO THE
EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 499,879, dated June 20, 1893.

Application filed July 30, 1888. Serial No. 281,453. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 792,) of which the following is a specification.

My invention relates to improvements in the mechanism of my phonograph, whereby it is made more convenient and efficient in operation.

The invention consists in the various novel devices and combinations of parts and in the method as fully hereinafter explained and pointed out by the claims.

In the accompanying drawings forming a part hereof,—Figure 1, is a front elevation of the complete machine with the front of the case broken away to show the driving motor. Fig. 2, is a top view of the complete machine. Fig. 3, is a top view of the phonograph proper on a somewhat larger scale omitting the driving and governing devices. Fig. 4, is a sectional view illustrating the movable center for supporting the outer end of the phonograph cylinder carrying shaft. Fig. 5, is an end view of the phonograph. Fig. 6, is a sectional view showing the traveler arm and connected parts. Fig. 7, is a top view of the driving motor. Fig. 8, is a sectional view of such motor. Fig. 9, is an end elevation of the speed governor. Fig. 10, is an elevation and partial section of the governor taken at right angles to Fig. 9. Fig. 11, is a top view of the contact arm of the governor; and Fig. 12, is a view principally in diagram showing the circuit connections of the electric motor and governor.

A is the frame of the phonograph proper which is mounted upon a box B, which in turn is mounted upon a suitable base C. The frame A is supported upon one end of the box B so that it overhangs such box to make room for a receptacle A³, which stands upon the base C under the overhanging phonograph frame and receives the shavings which are cut from the phonogram cylinder.

Between the phonograph frame A and the box B are placed cushions a of elastic material such as soft rubber, which, to a desirable

extent, prevent the vibrations of the motor contained within the box B from being transferred to the phonograph frame to the injury of the recording or reproduction of the sounds. 55

The frame A is secured to the box B by means of screws b which pass through slotted lugs b' on the frame A into the top of the box B. Lugs b² on the base B rise up on each side of the bottom edge of the frame A so as to hold such frame against lateral displacement. A screw c passing through a part of the frame A sets against a lug c' on the base B (shown in dotted lines in Fig. 1).

The screw c serves to adjust the frame A on the box B for the purpose of tightening the driving belt as will be presently explained, and the lugs b' are slotted to permit of this movement, the screws b being finally tightened after the proper adjustment of the driving belt has been secured. 70

D is the shaft of the phonograph, which is arranged horizontally and longitudinally upon the frame A. This shaft is held upon stationary centers so as to turn true and for the purpose of compensating for any wear. At the inner end of the frame A a standard d rises, through which passes the adjustable and removable centering pin d', which is held by a set screw d² passing through the top of the standard d. At the outer end of the phonograph shaft D the centering pin e is carried by a swinging arm D'. This swinging arm D' is pivoted upon a side extension A' of the frame A at one end and at its other end it is removably attached to a side extension A² of the frame A by means of a bolt e' and a thumb nut e². This bolt e' is pivoted on the end of the side extension A² of the frame A so as to swing vertically and it enters a slot e³ in the end of the swinging arm D'. By loosening the nut e², the bolt e' can be swung downwardly out of the slot e³ when the arm D' is free to be swung upon its pivot thus exposing the outer end of the phonograph shaft D, while by swinging the arm D' inwardly, the center e will properly engage with the end of the shaft D and by lifting the bolt e' and tightening the thumb nut e² the arm D' will be fastened rigidly against the end of the side extension A² of the frame A. To prevent the shaft D from too great a displacement when the arm D' is 95 100

swung outwardly, it passes through a slotted standard d^3 , which rises from the base A and encircles the shaft D loosely.

The shaft D is prevented from longitudinal displacement by means of the pulley E which is secured to the inner end of the shaft D and extends below the top of the frame A, so that when the arm D' is swung outwardly the pulley E will prevent the inner end of the shaft from disengaging totally from the center d' by reason of its impingement against the base A.

The center e is a pin which passes through the arm D' and is made adjustable by means of a screw f which turns into the arm D' and has a flange f' on its head which engages with a slot in the side of the pin e . By turning the screw f it will be seen that the center pin e will be adjusted and this without turning the center pin; the turning of the center pin might be attended with a disturbance of the relative adjustment of the parts.

Upon the shaft D between the standard d^3 and the swinging arm D' is mounted the phonogram cylinder F. This is preferably a cylinder having a slight taper on its external surface, its smaller end being at the outer end of the shaft. The standard d^3 is at the end of the top plate of the frame A, the extension of such frame beyond the box B being effected by the side bars A' A². The phonogram cylinder F being located between the side bars A' A² overhangs the frame, leaving a clear space beneath the cylinder through which the cuttings from the blank drop into the receptacle A³. The tapering cylinder F is adapted to receive a cylindrical phonogram blank F' having a tapering bore adapted to fit the surface of the cylinder. By swinging the arm D' outwardly, the phonogram blank F' can be removed from the cylinder or placed upon it. To stiffen the side bars A' A² of the frame and to prevent a vibrating or tuning fork action, which would injure the record, such side bars are connected by a cross bar A⁴ at their outer ends, such cross bar A⁴ curving downwardly out of the way so as not to interfere with the manipulations of the blanks.

G is a stationary rod which is mounted in standards on the frame A and its side bar A' in rear of and parallel with the shaft D. Upon the rod G is a sleeve G', which is adapted to slide and turn freely upon such rod, and which is of less length than the rod, so that its longitudinal movement thereon will be equal at least to the length of the phonogram cylinder F. Secured to the outer end of the sleeve G' is the rocking holding arm H which is rigidly fixed to said sleeve and projects upwardly and forward over the top of the phonogram cylinder. On its upper end the rocking holding arm H carries the swinging spectacle frame H', which is pivoted to said rocking holding arm so as to swing laterally across it. A spring pin g having a beveled end enters bevel slots g' in the hub of the spectacle

frame so as to hold the spectacle frame by spring pressure at either limit of its swinging movement. The eyes of the spectacle frame carry the recorder H² and the reproducer H³, which are brought alternately into operative relation with the surface of the phonogram blank by the swinging of the spectacle frame.

The head of the rocking holding arm H is provided with laterally extending arms g^2 g^3 through which pass set screws g^4 g^5 . These set screws bear against the spectacle frame when it is swung in one direction or the other, so as to adjust the spectacle frame to bring the recorder or reproducer into the desired relation with the surface of the blank. The screw g^4 effects this adjustment for the reproducer, the result being to adjust the reproducing point laterally across the track of record, so as to bring it into the best relation with the record for reproducing the sounds, which relation can be determined by listening to the instrument. The screw g^5 serves to adjust the relation of the recorder with the surface of the blank. The purpose of this is to enable the production of a double record upon the same blank and in parallel spiral lines.

It is evident that if the recording point be made narrow relative to the feeding movement, the space between the spiral lines of record may be as wide or wider than the track of the record itself. If such is the case the unoccupied space between the lines of record may be utilized for producing a second record. The screw g^5 enables the operator to adjust the recording point so as to track in this space between the lines of the first record, and the screw g^4 enables the operator to adjust the reproducer so that it will track on either record. The eyes of the spectacle frame are provided with fingers h through which pass the adjusting screws h' which rest upon the guide rest I, which is secured to the side bar A² of the frame in front of the phonogram cylinder and parallel with its axis. The bearing of the adjusting screw h' upon the straight guide rest I causes the recorder or reproducer to advance in a straight line along the surface of the blank. The ends of the adjusting screws h' which bear upon the guide rest I are enlarged so as to overlap said guide rest for a purpose which will be presently explained.

Upon the inner end of the sleeve G' is mounted the traveler arm I', which is adapted to turn freely on the sleeve G'. This traveler arm projects forward over the shaft D between the standard d^3 and the pulley E and has a section of a nut h^2 attached removably to its lower edge and engaging with a fine screw thread h^3 , which is cut upon the shaft D between the standard d^3 and the pulley E. The nut section h^2 is removably secured to the traveler arm I' by means of screws as shown, so that it can be readily replaced when worn out; it is also made remov-

able so that it can be made of steel and have a finely cut screw surface. The traveler arm itself may be of cast iron. The traveler arm projects over the shaft D and in front of it, and at its forward end is provided with a downwardly projecting finger i having its lower end i' turned upwardly to form a hook, the end of which hook terminates in a knife edge which engages the under side of a screw shaft i^2 mounted in standards on the top plate of the frame A in front of and parallel with the screw cut section of the shaft D. The shaft i^2 is provided with a screw thread i^3 which is coarser than the screw thread h^3 . The function of the screw thread i^3 is to move the traveler arm back with a speed which is greater than the forward movement which is given such traveler arm by the screw thread h^3 . This screw thread i^3 is a ratchet thread so as to engage effectively with the hook end of the finger i and to move the traveler arm backwardly without causing a friction which would result from a tendency to force the point i' out of the thread were such screw thread beveled equally in opposite directions. The shaft I^2 is driven from the shaft D by means of a belt i^3 which passes over small pulleys on both shafts. A lug j on the sleeve G' engages with a lug j' on the hub of the traveler arm I' , when the sleeve G' is turned back to the limit of its turning movement. This limit is determined by a finger j^2 on the rocking holding arm, which strikes the edge of the base A or the side bar A' when the spectacle frame is thrown backwardly over the center so that it will maintain itself in the elevated position. The lug j does not strike the lug j' until the limit of movement is nearly reached so that the effect will be to just lift the traveler nut h^3 out of engagement with the screw thread h^3 without engaging the point i' of the finger i with the reversing thread i^3 . Before this limit of the lifting movement of the spectacle frame is reached such movement does not affect the traveler arm. In front of the guide rest I and the reversing shaft I^2 and extending the entire length of the frame A and the side bar A' is a turning guide bar J. This turning guide bar is pivoted in lugs j^2 projecting from the frame, it being held eccentrically by centers j^3 passing through the lugs j^2 and engaging with the outer edge of the bar J at its ends. The inner edge j^4 of the bar J is made as a straight edge, and the enlarged ends of the adjusting screws h' project over this straight edge j^4 , and likewise a projection j^5 on the finger i attached to the end of the traveler arm I' projects over this edge j^4 . To one end of the bar J are secured two fingers k k' between which plays a cam k^2 , secured to the end of a turning stud k^3 having a thumb piece on its end. A spring k^4 throws the finger k down against the cam k^2 throwing the straight edge j^4 downward. The function of the cam k^2 is to turn the bar J against the tension of the spring k^4 and to

lift the edge j^4 against the tension of the spring. For this purpose the cam k^2 is provided with two risers k^5 , k^6 , the rise k^5 being less than the rise k^6 . Now by turning the cam k^2 with the fingers the effect will be to turn the bar J and to lift the edge j^4 by two successive movements. The effect of the first movement, that produced by the rise k^5 of the cam, is to lift the spectacle frame so that the recorder or reproducer will be disengaged from the surface of the blank and to lift the traveler nut h^3 out of the feeding screw h^3 so that the further feeding of the spectacle frame will be stopped. The clearance between the edge j^4 and the shoulder j^5 is slightly greater than that between the edge j^4 and the adjusting screw h' so that the recorder or reproducer will be first disengaged from the surface of the blank before the traveler nut is disengaged from its feed screw in order to prevent injury to the blank or the record on it. The effect of the second step of the movement, that produced by the rise k^6 of the cam, is to simultaneously raise the spectacle frame and traveler arm to a farther extent and to throw the point i' of the finger i into engagement with the reversing screw thread i^3 . This reverses the movement of the spectacle frame so that in reproducing the matter can be repeated to any extent desired. An arm m may be attached to the turning bar J and be connected by a cord or wire with a treadle J' so that the movements of the bar J may be produced by the foot of the operator. A scale K is attached to the front of the bar J and pointers m' are secured to the fingers h and project down in front of this scale so that the position of the recorder or the reproducer with relation to the surface of the phonogram blank can be determined. An adjustable knife L is pivoted to the rocking holding arm II for the purpose of turning off the surface of the blank. The swinging arm D' is provided with a projecting flange m^2 projecting inwardly around the center pin e and entering the end of the phonogram cylinder F, so as to act as a guard to the center pin, preventing the material which is cut from the blank from entering the space around the center and gumming up the bearing. A guard plate m^3 is attached to the side bar A' in rear of the phonogram cylinder so as to guide the shavings cut from the blank into the receptacle A^3 . Such shavings by reason of the movement given them by the turning of the cylinder, tend to pass over the extension A' of the frame; they are intercepted by the guard plate m^3 .

For driving the phonograph I prefer to employ an electric motor. This is included in the box B, the armature M of the motor being mounted on a vertical shaft M' , which passes through the top plate of the box B above which it is provided with a pulley n . An endless belt n' passes around this pulley n and passes under two guide pulleys n^2 , n^3 , which are held by centers in the frame A near the lower edge of the pulley E. The horizon-

tal shaft D of the phonograph is thus driven from the vertical shaft M' of the motor through an endless belt, whose direction is changed from a horizontal to a vertical plane by means of the guide pulleys n^2, n^3 . This belt connection between the motor and phonograph shaft is preferable to gearing since the slight mechanical vibrations of the motor are not transferred thereby to the phonograph. It will be seen that by adjusting the set screw c any tension desired can be given to the belt n' . The form of electric motor employed is a multipolar motor, it having four field magnet poles o, o', o^2, o^3 . These poles project upwardly from a four armed plate M². The armature M revolves above the plate M², the arms of the plate M² being wound with the field magnet wire. The plate M² is supported from the bottom of the box B by suitable legs o^4 and is steadied from the top plate of the box B by studs o^5 . The vertical shaft M' of the motor is stepped in the center of the plate M². A hole is cut through the center of the plate M² and into this hole is introduced from the under side of the plate M² a block p of metal carrying in its upper end a flat agate p' . The plug step p is made adjustable by means of a screw p^2 entering the bottom of the plate M² and bearing at one side of its head on the plug p , so that by turning this screw the plug p can be adjusted. The lower end of the shaft M' is brought to a rounded point where it rests on the agate p' , the shaft above the agate being surrounded by a bushing p^3 of brass or other suitable material; the shaft at its upper end is held by a center pin p^4 . The commutator brushes of the motor are shown at N N'. An oil tube N² extends from the top plate of the box B down to the step bearing of the motor shaft. The armature of the motor is a Gramme ring which is secured to a hub on the shaft by means of three layers O, O', O² of wood, which are placed so that the grain of the middle layer is at right angles to the grain of the two outside layers. The ring armature is of considerable size, so as to act as a fly wheel and so as to have a considerable surface velocity with a relatively low axle speed. The motor employed, being an electro-dynamic motor, has a high degree of efficiency, which efficiency is increased by the fact that it is a multipolar motor, since the magnetism has a shorter distance to travel through the iron of the armature and a more intense field is produced. With the fly wheel form of armature it would not be possible to get as intense a field or one as uniform with a field magnet having but two poles. I have also found that by using a motor with a vertical shaft a great reduction can be made in the power of the driving battery over what would be required by a motor mounted on a horizontal shaft. The motor being nicely balanced on its jewel step seems to require very little power to drive it and does not produce troublesome vibrations in the phonograph.

To control the speed of the motor and make it uniform, I provide a governor. This governor has a shaft P which is driven by an endless belt q from a pulley on the motor shaft. Centrifugal balls P' P² are secured to springs $q' q^2$ which are attached at their upper ends to the shaft P and at their lower ends hold a plate P³ which surrounds the shaft P and is raised and lowered by the centrifugal balls P' P². The shaft P is a vertical shaft stepped at its lower end on the flat agate q^3 and held at its upper end by a center pin q^4 . The movement of the plate P³ by the governor balls serves to make and break circuit between two springs $r r'$ which are held by a pivoted lever Q which is adjustable by means of a screw Q' passing through a suitable support with which its screw thread engages and also passing through the end of the lever Q below which it is provided with a nut and above which it has a spring r^2 to prevent any lost motion at the connection between the screw Q' and the lever Q. It will be seen that by adjusting the elevation of the lever Q the point at which the plate P³ will touch both the springs $r r'$ will be varied, and since this point is the point at which the speed of the motor is checked, it will be seen that the motor can be varied in its speed, which it is desirable to do in reproducing the sounds from phonogram blanks, since the speed at which the sound record was made will be indicated upon the blank and the machine can be set for that speed. The head Q² of the screw Q' is provided with a suitable index as shown, by means of which and the pointer r^3 the adjustment of the governor can be determined.

R is an electro-magnet whose armature R' breaks circuit at its back point r^4 , the armature being retracted by a spring r^5 .

The electric connections of the motor and the governor are illustrated in Fig. 12, in which 1, 2, represent the wires from the battery or other source of electrical energy leading to the binding posts 3, 4, which are located upon the box B. From the binding post 4, a wire 5 passes to the field magnet of the motor and from thence to the plate 6 of a plug switch. From the binding post 4 also extends a wire 7 connected to the base of the magnet R and hence to its armature R'. From the insulated back point r^4 of the magnet a wire 8 extends to the armature M of the motor and from thence to the plate 6 of the plug switch; also extending from the binding post 4 is a wire 9 which includes the coils of the magnet R and thence extends to the spring r at which the wire is broken. The wire 9 is continued however from the spring r' to the plate 6 of the plug switch. From the plate 10 of the plug switch a return wire 11 is run back to the binding post 3.

It will be seen that the armature of the motor, its field magnet and the governor magnet R are in three separate multiple arc circuits from the battery. The circuit of the field magnet is never opened except at the plug switch, which

opens all of the circuits at once. The circuit of the armature however of the motor is opened whenever the magnet R moves its armature R' off of the back point r^4 . The magnet R is wound to a high resistance and is extremely sensitive in its action, so that the instant the circuit to this magnet is closed by the plate P³ touching the springs r r' , the magnet will act and will open the circuit of the armature. This makes a much more sensitive governing device than if it were attempted to control the circuit of the armature by means of the governor directly. The field magnet circuit of the motor not being opened by the governor the spark which would be caused by the discharge of the field magnets will not be present.

What I claim as my invention is—

1. In a phonograph, the combination with the phonogram cylinder and its carrying shaft, of centers upon which said shaft turns and a swinging arm upon which one of said centers is mounted, substantially as set forth.

2. In a phonograph, the combination with the phonogram cylinder and its carrying shaft, of centers on which the said shaft turns, a swinging arm carrying one of said centers and a standard through which such shaft passes loosely for preventing displacement of the shaft when the center is swung away from its end, substantially as set forth.

3. In a phonograph, the combination with the phonogram cylinder and its carrying shaft, of centers on which said shaft turns, a swinging arm carrying one of said centers and the driving pulley on the shaft extending below the top of the frame so as to lock the shaft against longitudinal displacement, substantially as set forth.

4. In a phonograph, the combination with the cylinder shaft, of the cylinder mounted on one end of said shaft, centers on which the shaft turns and a swinging arm carrying the center at the cylinder end of the shaft whereby the end of the cylinder can be exposed for receiving or removing the phonogram blank, substantially as set forth.

5. In a phonograph, the combination with the supporting frame, of a shaft overhanging the frame, the phonogram cylinder placed on the overhanging portion of the shaft and a removable bearing for this overhanging end of the shaft, substantially as set forth.

6. In a phonograph, the combination with the supporting frame, of the cylinder shaft mounted upon such frame and overhanging the same at one end, the phonogram cylinder mounted on the overhanging end of the shaft, side bars extending from the frame out to the end of the shaft and a movable arm connecting such side bars and carrying the outer bearing of the shaft, substantially as set forth.

7. In a phonograph, the combination with the frame A, having side bars A' A² and the phonogram cylinder and shaft, of the swinging arm D' carrying the center for the outer end of the shaft and pivoted upon one of said

side bars and locked to the other side bar by the swinging bolt e' and nut e^2 , substantially as set forth.

8. In a phonograph, the combination with the frame A having side bars A' A² and the phonogram cylinder and shaft, of the swinging arm D' carrying the center for the outer end of the shaft and the bar A⁴ connecting the side bars of the frame, substantially as set forth.

9. In a phonograph, the combination with the rocking holding arm and the traveler arm, of a movable bar acting upon both of such arms and lifting them together, substantially as set forth.

10. In a phonograph, the combination with the rocking holding arm and the traveler arm, of a bar having a straight edge extending beneath both of such arms and pivoted so as to be capable of a turning movement, whereby it will lift said arms together, substantially as set forth.

11. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the pivoted lifting bar extending under both the rocking holding arm and the traveler arm and a cam for turning said lifting bar, substantially as set forth.

12. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the feeding and reversing screws, the turning lifting bar and the cam having two rises for giving such lifting bar two successive movements, substantially as set forth.

13. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the stud for lifting the traveler arm when the rocking holding arm has reached the limit of its lifting movement, substantially as set forth.

14. In a phonograph, the combination with the supporting rod and the sleeve sliding and turning thereon, of the rocking holding arm secured to said sleeve, the traveler arm turning upon such sleeve, a stop for determining the limit of the lifting movement of the rocking holding arm and studs for lifting the traveler arm when the rocking holding arm has reached the limit of its lifting movement, substantially as set forth.

15. In a phonograph, the combination with the rocking holding arm and the traveler arm, of the turning lifting bar acting upon both of said arms and the foot treadle connected with said turning lifting bar for operating it, substantially as set forth.

16. The method of producing more than one record on the same phonogram blank consisting of first making one record thereon and then adjusting the recording point to an intermediate position between the adjacent spiral lines of the preceding record and making an additional record, whereby without increasing the fineness of the feeding screw more matter can be recorded upon a phonogram blank of given length, substantially as set forth.

17. In a phonograph, the combination with the rocking holding arm, of the guide rest and the adjustment upon such guide rest having a bearing overlapping the guide rest and a turning lifting bar beneath the overlapping bearing, substantially as set forth.

18. In a phonograph, the combination with the phonogram cylinder and shaft, of the swinging arm carrying the center for the cylinder end of the shaft and the wax guard surrounding such center and entering the end of the cylinder, substantially as set forth.

19. In a phonograph, the combination with the phonogram cylinder and the turning off knife or tool, of the wax guard in rear of such cylinder for directing the shavings into a receptacle beneath the cylinder, substantially as set forth.

20. In a phonograph, the combination with the horizontal main shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor mounted upon a vertical shaft, and a belt connection between the motor shaft and the phonograph shaft, substantially as set forth.

21. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, the armature and the field magnet of said motor being connected in multiple arc, and a speed governor controlling the armature circuit, substantially as set forth.

22. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, and having its armature and its field magnet in separate multiple arc circuits, a magnet controlling the armature circuit, and a centrifugal governor controlling the said magnet, substantially as set forth.

23. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, a speed governor controlling the speed of said motor by opening the circuit thereof when a predetermined speed has been obtained, and an adjusting screw for varying the point at which the governor will affect the circuit, substantially as set forth.

24. In a phonograph, the combination with the phonograph shaft, the phonogram blank

carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, a centrifugal governor controlling such motor by closing circuit at contacts and an adjustment for varying the position of such contacts whereby the speed of the motor can be varied, substantially as set forth.

25. In a phonograph, the combination with the phonograph shaft, the phonogram blank carrier revolved thereby, and the recording and reproducing devices, of an electric motor connected with said shaft for driving the same, a magnet controlling said motor, contacts mounted upon an adjustably pivoted lever at which the magnet circuit is broken and a centrifugal governor moving a disk which closes the magnet circuit at such contacts, substantially as set forth.

26. In a phonograph, the combination with the frame supporting the phonograph shaft, the phonogram blank carrier, and the recording and reproducing devices, of an electric motor mounted upon a base and connected by a belt with the phonograph shaft, and means for adjusting the phonograph frame to tighten said belt, substantially as set forth.

27. In a phonograph, the combination with the phonograph proper in which are combined a phonograph shaft, a phonogram blank carrier revolved thereby, and recording and reproducing devices, the same being mounted upon a separate frame, of a base carrying a motor connected with the said shaft for driving the same, and cushions of elastic material between said base and the phonograph frame, substantially as set forth.

28. In a phonograph, the combination with the frame of the phonograph proper, of the base carrying a motor connected by a belt with the phonograph shaft, guiding lugs upon the base, slotted lugs and screws for securing the phonograph frame to the base and an adjusting screw for adjusting the phonograph frame upon the base for the purpose of tightening the belt, substantially as set forth.

29. In a phonograph, the combination with the feed screw and the traveler arm, of the nut section secured rigidly but removably to said traveler arm and engaging with said feed screw, substantially as set forth.

This specification signed and witnessed this 27th day of July, 1888.

THOS. A. EDISON.

Witnesses:

RICED. N. DYER,
WILLIAM PELZER.

1278

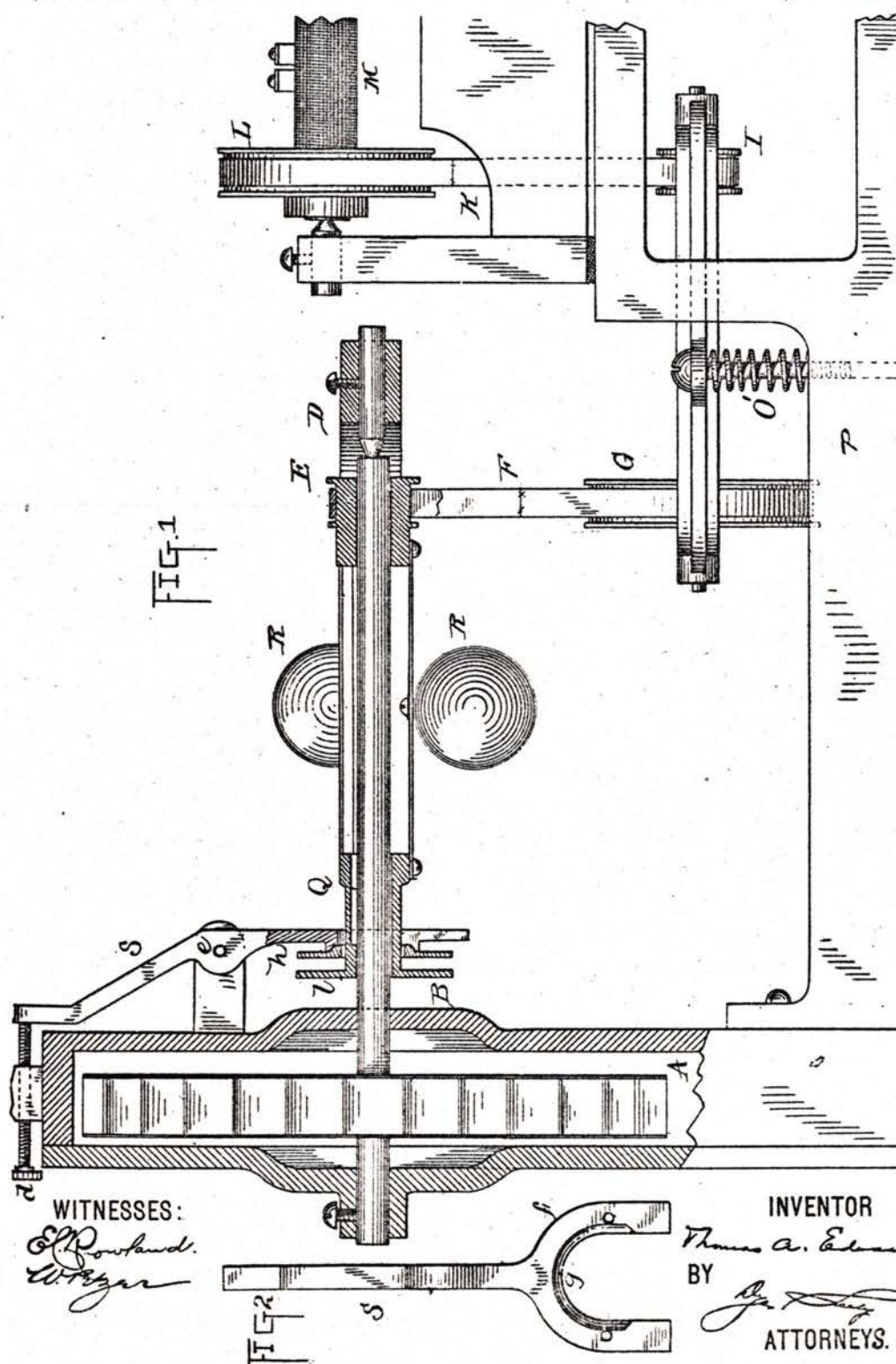
(No Model.)

3 Sheets—Sheet 1.

T. A. EDISON.
PHONOGRAPH.

No. 513,095.

Patented Jan. 23, 1894.



1279

(No Model.)

3 Sheets—Sheet 2

T. A. EDISON.
PHONOGRAPH.

No. 513,095.

Patented Jan. 23, 1894.

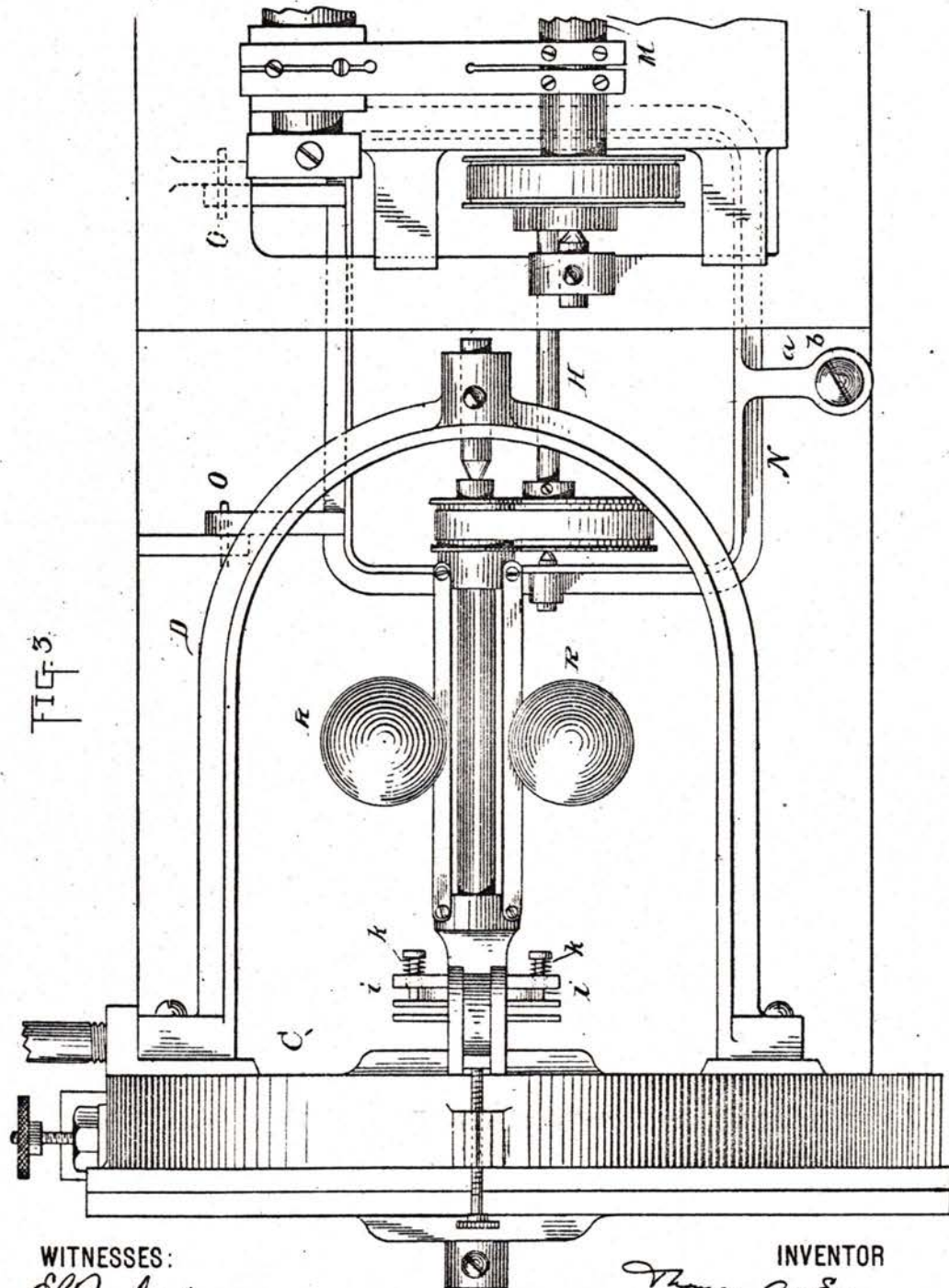


FIG. 3

WITNESSES:
E. Rowland
W. J. G. W. J. G.

INVENTOR
Thomas A. Edison
BY *John H. ...*
ATTORNEYS.

1280

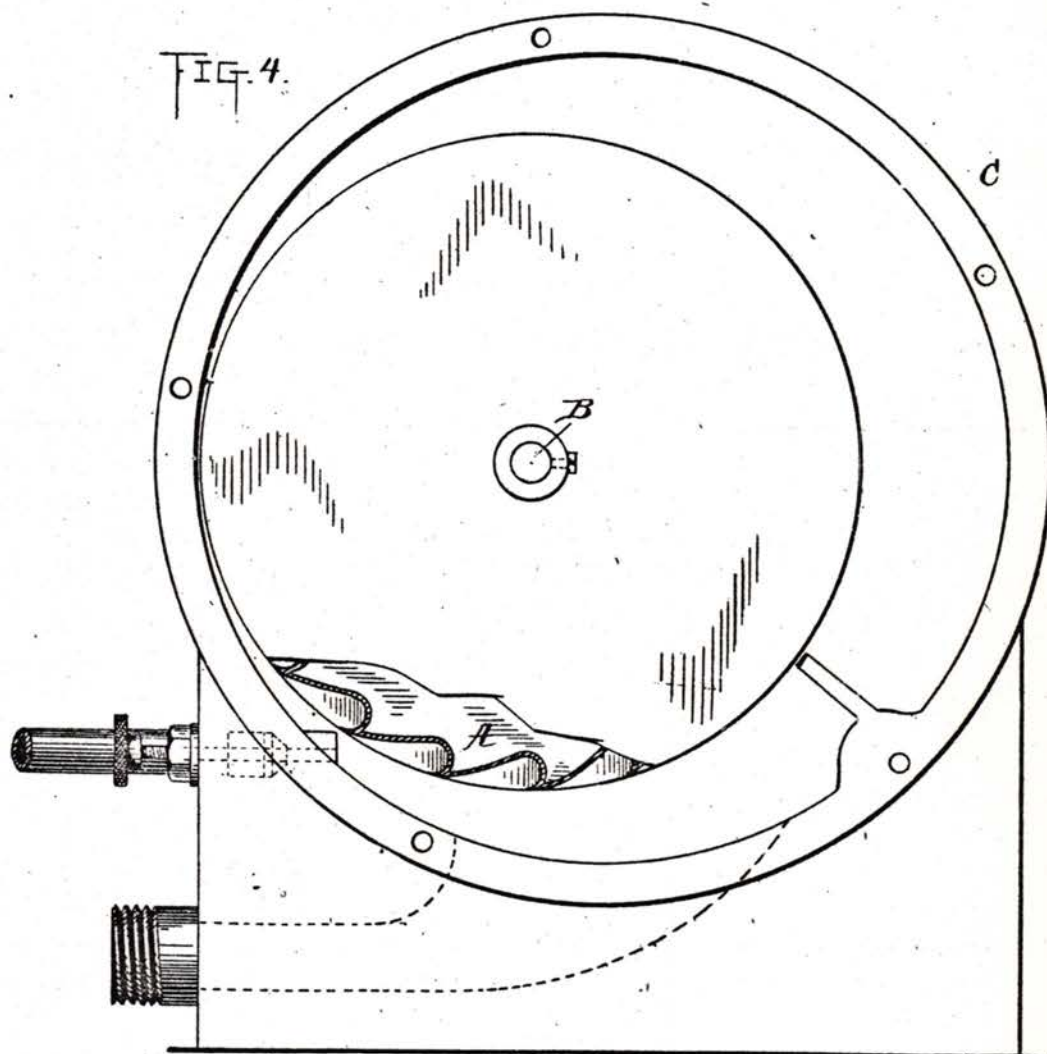
(No Model.)

T. A. EDISON.
PHONOGRAPH.

3 Sheets—Sheet 3.

No. 513,095.

Patented Jan. 23, 1894.



WITNESSES:

Ed. R. Rowland
W. H. Rizer

INVENTOR

Thomas A. Edison

BY

Geo. F. Long

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 513,095, dated January 23, 1894.

Application filed December 27, 1889. Serial No. 335,140. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park; in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 849,) of which the following is a specification.

This invention relates to motors for operating phonographs, to the connections between such motors and the phonograph itself, and to the devices for regulating the speed of the phonograph. I have heretofore usually employed an electric motor connected by belts with the feed screw of the phonograph and provided with a governor for regulating the speed which operated by breaking the motor circuit temporarily when the speed became too great. In my present invention I make use, preferably, of a hydraulic motor or water wheel placed on a shaft parallel with the feed screw and connected by belts and a counter-shaft which reduce the speed, with said feed screw. In connection with the motor I employ a centrifugal governor operating by the application of friction to a turning part and I make use of a loose friction shoe as one of the friction surfaces which always seats itself perfectly on the application of the friction and so makes the governing accurate and even.

My invention further includes a simple and effective arrangement for maintaining tension on the belts which connect the motor with the feed screw and for adjusting said tension when required.

My invention is illustrated in the accompanying drawings.

Figure 1 is a side elevation and partial section of the motor and governor and the connecting devices; Fig. 2, an elevation of the adjustable arm of the governor; Fig. 3, a top view of the motor governing and connecting devices, and Fig. 4, an end view of the motor with part of the case removed.

I have shown a simple form of water wheel A placed on the shaft B within the case C. A bracket D extends from the case C and supports the outer end of the shaft B. Upon said shaft is a pulley E connected by a belt F with a grooved wheel G on a spindle H which has also upon it a pulley I connected by a belt K with a grooved wheel L on the phonograph

feed screw M, which, as will be understood, carries the phonogram cylinder (not shown). The wheels G and I are supported in bearings on a frame N, the rear portion of which is hinged at O. A lug *a* extends from the front of the frame N and through this passes a screw *b* which enters the supporting base P of the machine.

Upon the screw *b* between the base P and frame N is coiled a spring O' so that the frame N is supported upon said spring and may be adjusted upon its hinges by adjusting the screw *b* to alter the tension of said spring. The pulleys G and I being supported by the movable frame N below the relatively stationary pulleys E and L, it will be seen that the tension of the belts F and K is dependent upon the height to which said frame is adjusted and that the belts may therefore be both tightened or loosened by screwing the screw *b* in or out.

Upon the shaft B is placed the sliding sleeve Q to which are attached the governor balls R. An arm S rests at its upper end against an adjusting screw *d*, is pivoted at *e* and terminates at a fork *f* through which the shaft B and sleeve Q pass. The fork *f* has on its face a curved rim *g* within which is a flanged disk *h* placed loosely over the sleeve Q. The disk *h* is held by pins *i* which pass loosely through the sides of the fork *f* and springs *k* are placed between the fork and the heads of said screws, so that the disk *h* is enabled to yield and to rock back toward the fork *f*, being however normally held parallel to the fork by the springs; at the inner end of the sleeve Q is a disk or flange *l*. It will be seen that when the speed of the motor becomes too great the governing balls will fly out and draw the disks *l* against the disks *h* whereby a friction is produced which will retard the motion and slacken the speed. The friction regulation shown and described is particularly adapted to use with the phonograph in which it is necessary that the regulation shall not be of uneven or jerky character.

While it is not essential in the phonograph that the speed shall be absolutely constant at all times, it is necessary for the best reproduction and especially for the reproduction of music that the speed of any short interval

or time shall be substantially the same, that is for instance, that during any one revolution of the phonograph there shall be no substantial change of speed, since an alteration of speed under such circumstances will alter the pitch of the sound and so destroy any musical effect; by employing the loose friction shoe which will always engage the turning disk in the same position because it seats itself perfectly at all times against it this result is accomplished. With rigidly supported disks the necessary inaccuracies in mechanical construction will cause uneven friction at different parts of the same revolution and so the speed will vary at these times; but with the arrangement described the degree of friction will remain the same during the whole revolution. The degree of speed at which the friction will be applied may be determined by adjusting the screw *d* so as to move the fork *f*.

The use of this character of governor is also particularly applicable to the operation of phonographs by water motors in which the speed is apt to be varied in consequence of variations in pressure and in which the ordinary mode of regulation by cutting off the supply will be likely to produce irregular variations of speed.

What I claim is—

1. In a phonograph, the combination of the feed screw, a rotating motor having its shaft geared to said feed-screw, a centrifugal governor on the motor shaft, a friction disk connected with the governor, and another friction member with which said friction disk

engages, one of said friction members being a rocking shoe, substantially as set forth.

2. In a phonograph, the combination of the feed-screw, a rotating motor having its shaft geared to said feed-screw, a centrifugal governor on the motor shaft, a friction disk connected with the governor, and a rockingspring supported stationary disk with which said friction disk engages, substantially as set forth.

3. In a phonograph, the combination of the feed screw, a rotating motor having its shaft geared to the feed screw, a centrifugal governor on the motor of the shaft, a friction disk connected with the governor, and another friction disk the same being stationary and pivoted and provided with a yielding support enabling it to rock on its pivot, substantially as set forth.

4. In a phonograph, the combination of the feed-screw, the rotating motor, the pulley on the shaft of the feed-screw, the pulley on the motor shaft, the two intermediate pulleys, the connecting belts and the adjustable frame carrying said intermediate pulleys, substantially as set forth.

This specification signed and witnessed the 11th day of December, 1889.

THOS. A. EDISON.

Witnesses:

D. H. DRISCOLL,
W. PELZER.

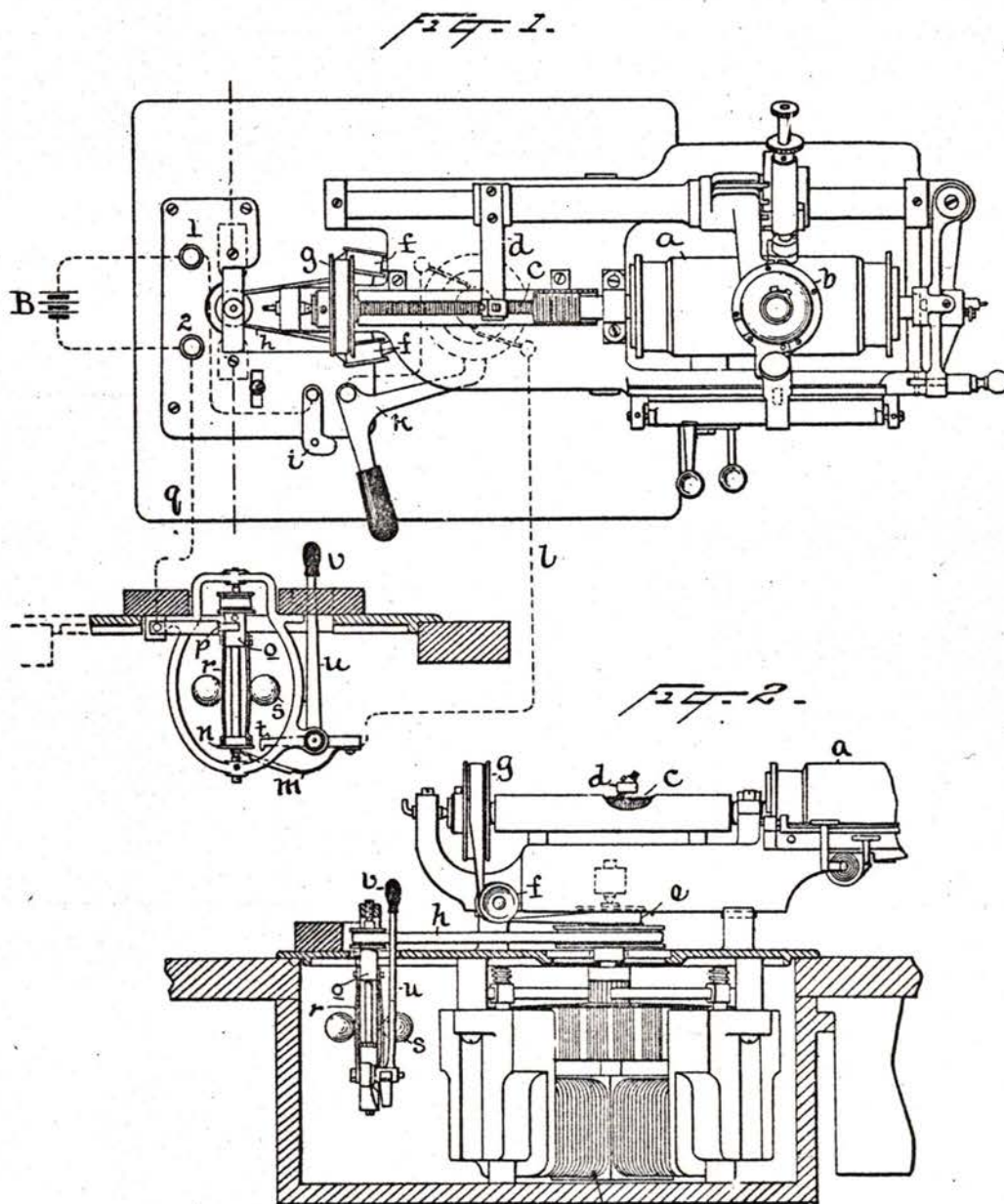
1283

(No Model.)

T. A. EDISON.
PHONOGRAPH.

No. 513,097.

Patented Jan. 23, 1894.



Witnesses
Horris A. Clark.
W. Pizer

Inventor
Thomas A. Edison
 By *his Attorneys* *J. P. Day*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 513,097, dated January 23, 1894.

Original application filed December 3, 1890, Serial No. 373,413. Divided and this application filed May 24, 1893. Serial No. 476,315. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 965,) of which the following is a specification.

This application is a division of my application filed December 3, 1890, Serial No. 373,413, and relates to the governor for controlling the speed of the phonograph, which governor is shown and described, but not claimed, in said specification.

The object of my invention is to provide the phonograph driven by an electric motor with a simple and effective governing device for the regulating speed of the motor, and consequently that of the phonograph, the operation being performed by the use of a centrifugal governor, which, when a certain speed is reached, opens the circuit of the motor, means being provided for altering or adjusting the point at which the circuit will be broken.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a top plan view of the phonograph, with the governor shown in elevation, detached from the machine, and with the electrical connections and electric motor illustrated in diagram; Fig. 2, a front elevation showing the motor and governor and a portion of the phonograph itself.

The phonograph shown is of the usual character, and it is not necessary to describe it in detail further than to state that *a* is the phonogram blank, *b* the frame which carries the recorder and reproducer, *c* the feed screw, and *d* the feed arm. The phonograph is operated by the electric motor *A*, from whose shaft a belt *e* extends, passing under pulleys *f, f*, and over a pulley *g* on the shaft of the feed screw. A belt *h* also extends from a pulley on the motor shaft to the movable portion of the centrifugal governor.

B represents the battery for supplying current to the electric motor. The circuit from the battery goes to the binding posts 1 and 2, and the motor circuits are as follows: From binding post 1 to the stationary contact *i* of the switch *k*, from the movable part of the

switch *k* to the motor, from the other terminal of the motor by wire *l* to the spring *m* which rests against the disk *n* at the lower part of the movable portion of the governor, thence through the governor to the sleeve *o* at the upper part thereof, and by spring *p*, which rests on sleeve *o*, to wire *q*, and so to binding post 2. The details of the field magnet and armature connections of the motor are not shown.

The governor is of the ordinary form, the lower ring having the disk *n* being connected by springs *r*, carrying balls *s*, with the upper sleeve *o*, the result being that as the speed of the motor increases, the disk *n* is caused to rise, and when it has risen to a sufficient extent will leave the spring *m* and open the motor circuit. The spring *m* follows the rising disk *n* until it reaches the adjustable stop *t*, which checks any further spring movement of the spring *m* and permits the disk *n* to leave the spring. The position of the stop *t* is adjusted by means of the arm *u* which extends up through the upper plate of the phonograph and terminates in a handle *v*. By this adjustment of the position of stop *t*, the point at which the circuit is broken is determined. This provides a very simple and convenient arrangement for the purpose, and by arranging both the spring *m* and the spring *p* so that they both bear upon the movable portion of the governor, the necessity of taking the current through the bearings of the governor from a movable to a stationary part thereof is avoided, and a constant and reliable electrical connection is always assured.

I do not claim in this application any features of construction of the phonograph itself, of the motor, or of the relative arrangement and connections of the motor and phonograph, this application being confined solely to the governor, which I have been required by the Patent Office to embody in a separate application.

What I claim is—

1. The combination with a phonograph and an electric motor for operating the phonograph, of a centrifugal governor mechanically connected with the motor, and two contacts in the motor circuit independent of the bearings of said governor and bearing on the movable portion of the governor, one of said con-

tacts being arranged to make and break contact with said movable part as the same is moved, substantially as set forth.

2. The combination with a phonograph and a motor for operating the same, of a centrifugal governor mechanically connected with said motor, a disk connected with the moving part of said governor, a stationary contact in the motor circuit normally resting on the face of said disk, and another stationary contact in the motor circuit resting on the movable part of said governor, substantially as set forth.

3. The combination with a phonograph and a motor for operating the same, of a centrifugal governor mechanically connected with the motor, a spring contact in the motor circuit normally resting upon the movable part of said governor, a stop in the path of spring movement of said contact, and another connection with said governor, completing the motor circuit, substantially as set forth.

4. The combination with a phonograph and a motor for operating the same, of a centrifugal governor mechanically connected with the motor, a spring contact in the motor circuit normally resting upon the movable part of said governor, an adjustable stop in the path of spring movement of said contact, and another connection with said governor, completing the motor circuit, substantially as set forth.

5. The combination with a phonograph and a motor for operating the phonograph, of a centrifugal governor mechanically connected with the motor, a disk connected with the movable part of said governor, a spring in the motor circuit normally resting on said disk, a pivoted arm in the path of spring movement of said spring, means for raising and lowering said arm, another spring contact resting on the movable part of the governor, and an electric circuit including the motor, the governor and both said spring contacts, substantially as set forth.

6. The combination with a phonograph and a motor for operating the same, of a centrifugal governor mechanically connected with the motor, said governor having a disk and a sleeve united by springs and carrying governor balls, a stationary contact normally bearing on said disk, another stationary contact connected with said sleeve, and an electric circuit including the motor, the governor and both said contacts, substantially as set forth.

This specification signed and witnessed this 22d day of May, 1893.

THOS. A. EDISON

Witnesses:

JOHN F. RANDOLPH,
HARRY F. MILLER.

1286

No. 667,202.

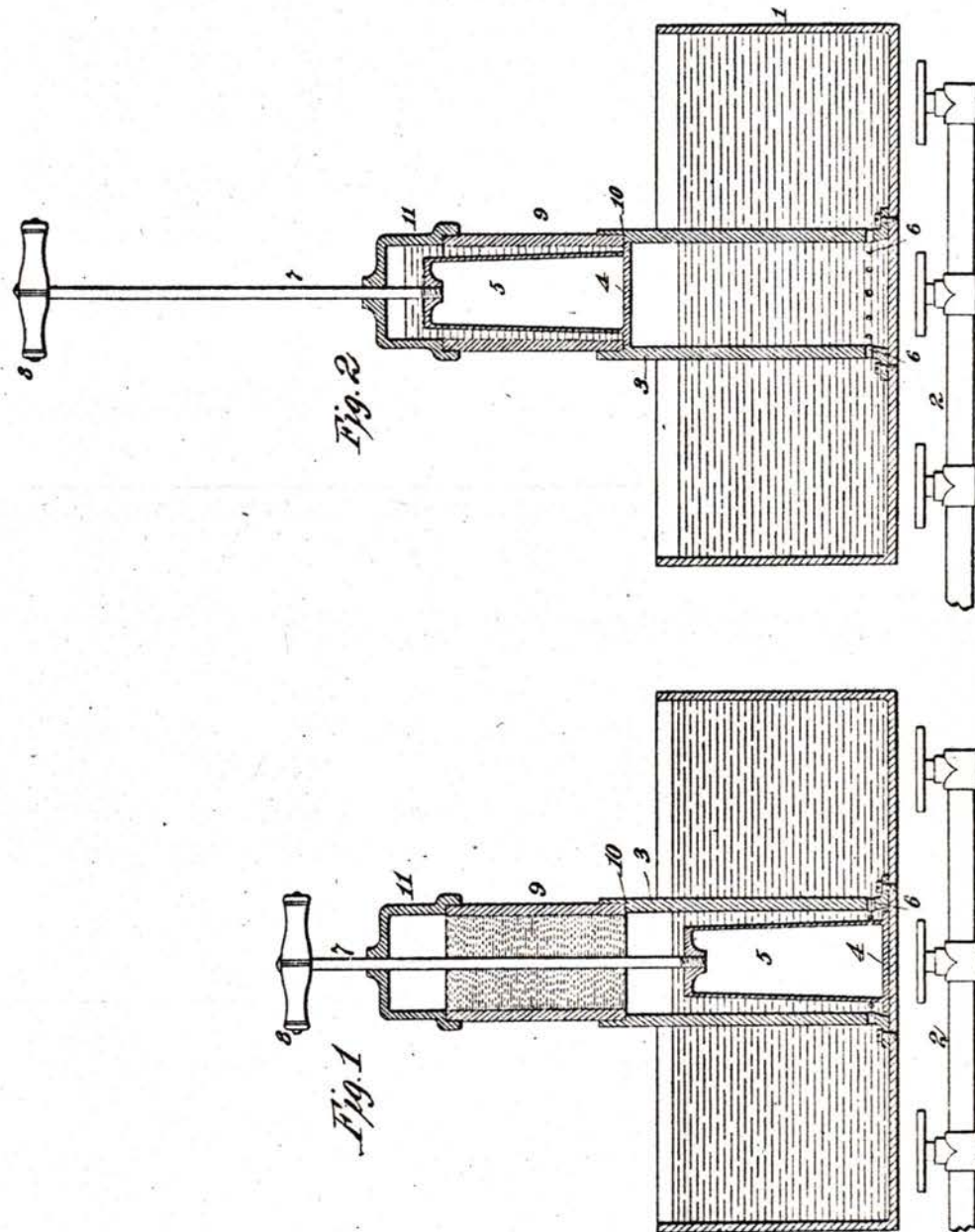
Patented Feb. 5, 1901.

T. A. EDISON.

APPARATUS FOR DUPLICATING PHONOGRAPH RECORDS.

(Application filed May 8, 1900.)

(No Model.)



Witnesses:

Geo. F. Coleman
Geo. R. Taylor

Inventor

Thomas A. Edison
by *Alfred Edmunds* att'y.

Att'y.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

APPARATUS FOR DUPLICATING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 667,202, dated February 5, 1901.

Application filed May 8, 1890. Serial No. 15,875. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Duplicating Phonograph-Records, (Case No. 1,037,) of which the following is a description.

In my companion application filed on even date herewith (Edison, No. 1,036) I describe an improved process for duplicating phonograph-records, and particularly for the duplicating of cylindrical phonographic records, consisting in forming a mold carrying on its bore the record in negative, in introducing within the mold around a core a molten material the surface of which becomes chilled by contact with the mold, in then permitting the duplicate so formed to contract, in then removing the contracted duplicate and the core from the mold by a direct longitudinal movement, in then separating the core from the duplicate before the latter has contracted sufficiently to prevent such separation, and in finally dressing the ends of the duplicate and in reaming out its interior.

My present application relates to an improved apparatus for the convenient, economical, and effective carrying out of this process; and my object is to provide an apparatus wherein a process of duplicating phonograph-records from a continuous mold can be effectively followed.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view of a suitable apparatus for the purpose, illustrating the plunger and piston in their lowermost positions; and Fig. 2, a similar view showing the same parts in their elevated positions.

In both the above views corresponding parts are represented by the same numerals of reference.

The apparatus illustrated in the figures is designed for the duplicating of cylindrical phonographic records, and it will be so described; but the applicability of my improved apparatus for the duplication of other varieties of records will be apparent to those skilled in the art.

In the drawings, 1 represents a suitable jar or tank of the proper dimensions and made of any desired material. Within the jar or tank 1 I place the material of which the duplicate records are to be formed and which may be maintained in a molten condition by the application of heat in any way—as, for example, by a gas-tube 2, supplying a number of jets, as shown. The proper level of the molten material is indicated, and this level should be approximately maintained by the addition of fresh material from time to time within the tank, as the liquid material may be withdrawn during the operation. The material in the tank 1 and of which the duplicate records are to be formed may be of any suitable character; but, preferably, it is a metallic soap or a combination of several soaps to which has been added a material not affected by water, such as ceresin, whereby the resulting duplicates will be protected from the effects of atmospheric moisture. Mounted within the tank and secured to its bottom is an open-ended cylinder 3, in which works a piston 4. A tapered core 5 is connected to or formed integrally with the piston 4, and said core is preferably hollow, so as to present a thin wall to the material, whereby the core will very quickly reach the temperature of the molten material when it is immersed therein. A number of openings 6 are formed in the cylinder 3, near the bottom thereof, below which openings the piston 4 passes in reaching its downward position, as shown in Fig. 1, whereby the liquid material may flow through said openings into the cylinder above the piston. Connected to the core 5 is a plunger 7, having an operating-handle 8. The connection between the core and plunger is such as will permit a separation of these parts, ordinary screw-threads being shown. 9 represents a mold which rests within a shoulder 10, formed at the top of the cylinder, and which mold carries on its bore the representation in negative or relief of a phonograph-record which it is desired to duplicate. This mold is preferably obtained by the process described in my application for Letters Patent filed March 5, 1898, Serial No. 672,650, by first depositing upon the original record a suitable metal in the form of an infinitesimally thin film by a process of vacuum de-

posit, by then electroplating or otherwise securing upon the film so obtained a sufficiently thick layer of the same or different metal, and by then properly backing up the metal so deposited or otherwise applied to the vacuum film either before or after the separation of the original record from the inclosing coating of metal either by contracting the record or by melting it out or in any other suitable way. The advantage of making a matrix or mold by first depositing upon an original phonograph-record a metal by a process of vacuum deposit is that an absolutely accurate copy in negative of such record will be produced, irrespective of the fineness thereof. The mold 9 is preferably made of sufficient mass or thickness as to effectively chill the molten material when the latter is introduced therein, as I shall explain. Carried by the upper part of the mold is an inclosing cap 11, which may be secured onto the mold and which forms a bearing for the plunger 7.

In making duplicate records with my improved apparatus I prefer to proceed substantially as follows: Molten material being placed within the tank or jar 1 is maintained in its liquid or fluid condition by the application of heat. The mold 9 being exposed to the atmospheric temperature is relatively cold. The plunger 7 is first depressed, so as to force the piston 4 downward within the cylinder, ejecting the liquid material from beneath it, which material passes out through the openings 6. The bore of the cylinder 3 may, as shown, be slightly enlarged below the openings 6, so as to permit the piston 4 to pass beneath the same. As soon as the piston 4 passes below the openings 6 the molten or fluid material enters the cylinder above the piston, so as to fill the cylinder to the level of the liquid in the tank or jar. Owing to the thin wall of the core 5 the latter will almost immediately reach the temperature of the molten material, so that said core will not chill the latter. If a solid core is used, it will require to be immersed within or below the surface of the liquid material for a longer time to enable its temperature to reach that of the molten mass; but with this exception the process will be equally operative with a solid core as with a hollow core.

Assuming the hollow core to be used and that its temperature reaches that of the molten material almost immediately, the plunger 7 will be elevated so as to carry the charge of molten material above the piston into the mold, as shown in Fig. 2, a greater or less excess of material passing above the mold into the cap 11. By employing the cap 11 it will be obvious that the level of the liquid material in the tank or jar may be varied considerably without affecting the operation. The liquid molten material entering the mold 9 will engage all portions of the record formed on the bore thereof, and the materially lower temperature of the mold will result in the

almost instantaneous chilling of the surface of the molten material therein. In order to facilitate this surface-chilling of the liquid molten material entering the mold, the latter may be actually cooled by artificial means below atmospheric temperature—as, for instance, by the circulation of cold water through a water-jacket surrounding the mold or by a blast of cold air equably directed to all portions of the mold. The chilling of the surface of the molten material in the mold results in the setting of the positive impression thus secured from the negative record. The chilling of the molten material in the mold progresses toward the center and any contraction in bulk will be compensated by the surplus material within the cap 11. As soon as the material within the mold has been chilled, throughout the entire thickness thereof, the material, with the piston, core, cap, and plunger, is removed from the cylinder, and the material is allowed to cool by exposure to a cold atmosphere or by an air-blast until the solidified material has contracted away from the bore of the mold, so as to permit it to be removed therefrom by forcing the plunger downward. The plunger is then removed from the core and the latter is extracted from the cast material, carrying the positive record on its periphery, before the material is contracted sufficiently upon the core as to prevent this separation. Since the conductivity of heat from the material is effected slowly, the outer surface of the molded duplicate becomes hard and set, while the inner portion thereof next to the core is still in a relatively plastic condition, so that this separation of the core can with ordinary care be readily effected. The resulting duplicates thus secured after reaching the normal temperature are properly dressed at the ends and are reamed internally to the proper size, being then ready for use. With records made in this way the contraction of the material radially to separate it from the mold is accompanied by a considerable longitudinal contraction following the instant when the surface is first set by the chilling effect of the mold and progressing until the material reaches the normal temperature. For this reason it is necessary that the original record from which the matrix is made be formed on a phonograph or allied talking-machine having a fewer number of threads on its feed-screw than the instrument on which the duplicates are finally used in order that when the contraction has progressed to its finality the pitch of the record-thread on the duplicate will correspond to the pitch of the feed-screw of the reproducing-machine, or approximately to that pitch, it being possible with modern reproducing apparatus to effect a satisfactory reproduction from a record, even when the pitch thereof differs slightly from that of the feed-screw of the machine. The pitch of the feed-screw of the machine on

which the original record is made will differ from the pitch of the feed-screw of the machine on which the resulting duplicates are to be used to an extent depending upon the coefficient of contraction of the material used and will be determined by experiment with the material employed. It will be of course understood that after the mold has been removed from the cylinder and the separation of the cast duplicate is being effected therefrom a new mold and its accompanying parts may be inserted in place upon the cylinder and the operations repeatedly carried on therewith.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. An apparatus for duplicating phonograph-records, comprising in combination a mold carrying a record in negative on its bore, a core movable into and out of the mold, and means for causing a supply of molten material to enter the mold simultaneously with the introduction therein of the core, substantially as set forth.

2. An apparatus for duplicating phonograph-records, comprising in combination a mold carrying a record in negative on its bore, a cylinder supporting said mold and supplied with molten material, a core movable in said cylinder and mold, and a piston movable with the core for introducing a charge of molten material into the mold simultaneously with the introduction therein of said core, substantially as set forth.

3. An apparatus for duplicating phonograph-records, comprising in combination a mold carrying a record in negative on its bore, a cylinder supporting said mold and supplied with molten material, a hollow core movable in said cylinder and mold, and a piston movable with the core for introducing a charge of molten material into the mold simultaneously with the introduction therein of said core, substantially as set forth.

4. In an apparatus for duplicating phonograph-records, the combination of a mold carrying a record in negative on its bore, a cylinder removably supporting said mold and supplied with molten material, a core movable in said cylinder and mold, and means for introducing molten material into the mold simultaneously with the introduction of the core therein, substantially as set forth.

5. An apparatus for duplicating phonograph-records, comprising in combination a receptacle containing molten material, a cylinder in said receptacle, a mold carried by said cylinder, a core movable in the cylinder and mold, and a piston working in said cyl-

inder simultaneously with said core, substantially as set forth.

6. An apparatus for duplicating phonograph-records, comprising in combination a receptacle for containing a molten material, a cylinder in said receptacle, a mold removably carried by the cylinder and having a record in negative on its bore, a core movable in the cylinder and mold, a piston working in said cylinder and connected to the mold, and a plunger for operating said core, substantially as set forth.

7. An apparatus for duplicating phonograph-records, comprising in combination a receptacle for containing a molten material, a cylinder in said receptacle, a mold removably carried by the cylinder and having a record in negative on its bore, a core movable in the cylinder and mold, a piston working in said cylinder and connected to the mold, and a plunger removably connected with the core for operating the latter, substantially as set forth.

8. In an apparatus for duplicating phonograph-records, the combination of a receptacle or tank for containing the molten material, a cylinder therein, a mold movably carried by the cylinder and having a record in negative on its bore, a core working in the cylinder and mold, a piston connected to the core, and a cap secured over the upper side of the mold, substantially as set forth.

9. In an apparatus for duplicating phonograph-records, the combination of a receptacle or tank for containing the molten material, a cylinder therein, a mold movably carried by the cylinder and having a record in negative on its bore, a core working in the cylinder and mold, a piston connected to the core, and a cap removably secured over the upper end of the mold, substantially as set forth.

10. In an apparatus for duplicating phonograph-records, the combination of a receptacle or tank for containing the molten material, a cylinder therein, a mold movably carried by the cylinder and having a record in negative on its bore, a core working in the cylinder and mold, a piston connected to the core, a cap secured over the upper end of the mold, a bearing in said cap, and a plunger working in said bearing and connected to the core, substantially as set forth.

This specification signed and witnessed this 30th day of April, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,
FRANK L. DYER.

No. 667,662.

Patented Feb. 5, 1901.

T. A. EDISON.

PROCESS OF DUPLICATING PHONOGRAPH RECORDS.

(Application filed May 8, 1900.)

(No Model.)

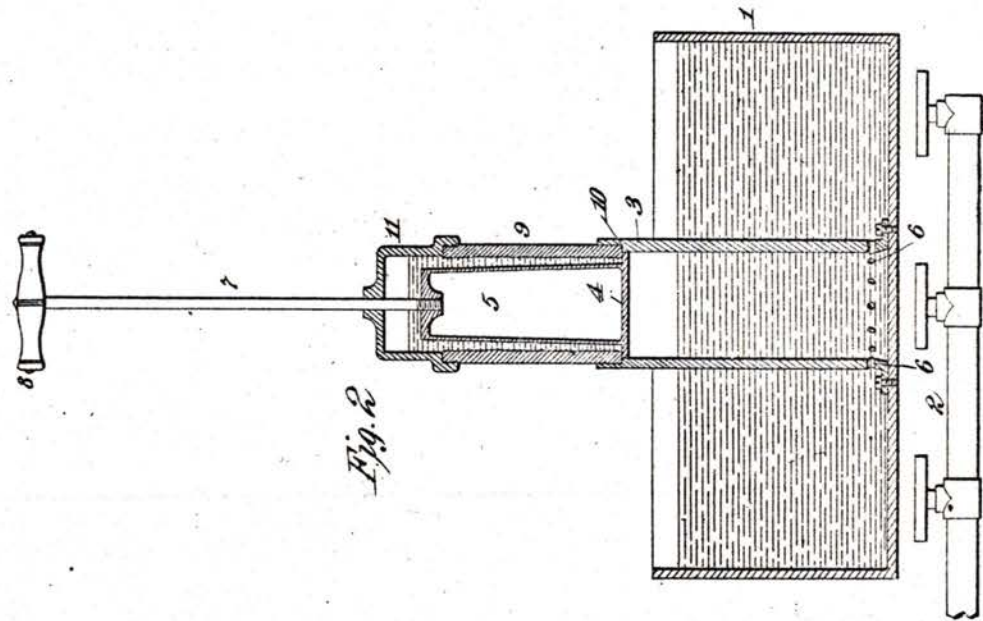


Fig. 2

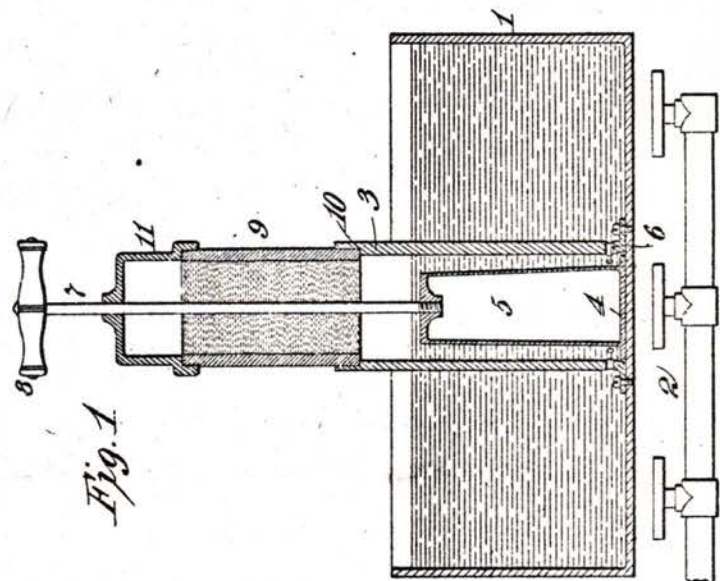


Fig. 1

Witnesses:

*Jas. F. Coleman**Geo. R. Taylor*

Inventor

*Thomas A. Edison**by* *Spencer Edmunds*

Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF DUPLICATING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 667,662, dated February 5, 1901.

Application filed May 8, 1900. Serial No. 15,874. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, county of Essex, and State of New Jersey, have invented a certain new and useful Improved Process of Duplicating Phonograph-Records, (No. 1,036,) of which the following is a specification.

My invention relates to an improved process for duplicating phonograph-records, and the process is of the character covered by my Patent No. 484,582, of October 18, 1892, wherein a matrix of an original record is employed as a mold for the making of the duplicates. In the specific process described in my previous patent the matrix secured from the original record is divided longitudinally, so as to form a sectional mold in which are cast the desired duplicates. My present invention is designed specifically as an improvement on said process, and my object is to provide a process wherein the production of the duplicate records will be facilitated and wherein the character of the resulting duplicates will be improved, since the mold used is continuous on its bore.

My present process depends upon the fact that after a molten metallic soap or a mixture of soaps or other suitable material has been introduced within a mold carrying the representation of a phonographic record in relief on its bore and allowed to set a sufficient contraction of the resulting duplicate can be secured as to permit of a longitudinal separation of the duplicate from the mold, whereby a continuous mold can be employed for the carrying on of the process.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view of a suitable apparatus for the purpose, illustrating the plunger and piston in their lowermost position; and Fig. 2, a similar view showing the same parts in their elevated positions.

In both the above views corresponding parts are represented by the same numerals of reference.

The apparatus illustrated in the figures is designed for the duplicating of cylindrical phonographic records, and it will be so de-

scribed; but the applicability of my process for the duplication of other varieties of records will be apparent to those skilled in the art.

In the drawings, 1 represents a suitable jar or tank of the proper dimensions and made of any desired material. Within the jar or tank 1 I place the material of which the duplicate records are to be formed and which may be maintained in a molten condition by the application of heat in any way—as, for example, by a gas-tube 2, supplying a number of jets, as shown. The proper level of the molten material is indicated, and this level should be approximately maintained by the addition of fresh material from time to time within the tank as the liquid material may be withdrawn during the operation. The material in the tank 1 and of which the duplicate records are to be formed may be of any suitable character; but preferably it is a metallic soap or a combination of several soaps to which has been added a material not affected by water, such as ceresin, whereby the resulting duplicates will be protected from the effects of atmospheric moisture. Mounted within the tank and secured to its bottom is an open-ended cylinder 3, in which works a piston 4. A tapered core 5 is connected to or formed integrally with the piston 4, and said core is preferably hollow, so as to present a thin wall to the material, whereby the core will very quickly reach the temperature of the molten material when it is immersed therein. A number of openings 6 are formed in the cylinder 3, near the bottom thereof, below which openings the piston 4 passes in reaching its downward position, as shown in Fig. 1, whereby the liquid material may flow through said openings into the cylinder above the piston. Connected to the core 5 is a plunger 7, having an operating-handle 8. The connection between the core and plunger is such as will permit a separation of these parts, ordinary screw-threads being shown.

9 represents a mold which rests within a shoulder 10, formed at the top of the cylinder, and which mold carries on its bore the representation in negative or relief of a phonograph-record which it is desired to duplicate. This mold is preferably obtained by

the process described in my application for Letters Patent filed March 5, 1898, Serial No. 672,650, by first depositing upon the original record a suitable metal in the form of an infinitesimally-thin film by a process of vacuum deposit, by then electroplating or otherwise securing upon the film so obtained a sufficiently thick layer of the same or different metal, and by then properly backing up the metal so deposited or otherwise applied to the vacuum film either before or after the separation of the original record from the inclosing coating of metal either by contracting the record or by melting it out or in any other suitable way. The advantage of making a matrix or mold by first depositing upon an original phonograph-record a metal by a process of vacuum deposit is that an absolutely accurate copy in negative of such record will be produced irrespective of the fineness thereof. The mold 9 is preferably made of sufficient mass or thickness as to effectively chill the molten material when the latter is introduced therein, as I shall explain. Carried by the upper part of the mold is an inclosing cap 11, which may be secured onto the mold and which forms a bearing for the plunger 7.

In carrying out my improved process with an apparatus of this type I prefer to proceed substantially as follows: Molten material being placed within the tank or jar 1 is maintained in its liquid or fluid condition by the application of heat. The mold 9, being exposed to the atmospheric temperature, is relatively cold. The plunger 7 is first depressed, so as to force the piston 4 downward within the cylinder, ejecting the liquid material from beneath it, which material passes out through the openings 6. The bore of the cylinder 3 may, as shown, be slightly enlarged below the openings 6, so as to permit the piston 4 to pass beneath the same. As soon as the piston 4 passes below the openings 6 the molten or fluid material enters the cylinder above the piston, so as to fill the cylinder to the level of the liquid in the tank or jar. Owing to the thin wall of the core 5 the latter will almost immediately reach the temperature of the molten material, so that said core will not chill the latter. If a solid core is used, it will require to be immersed within or below the surface of the liquid material for a longer time to enable its temperature to reach that of the molten mass; but with this exception the process will be equally operative with a solid core as with a hollow core.

Assuming the hollow core to be used and that its temperature reaches that of the molten material almost immediately, the plunger 7 will be elevated, so as to carry the charge of molten material above the piston into the mold, as shown in Fig. 2, a greater or less excess of material passing above the mold into the cap 11. By employing the cap 11 it will be obvious that the level of the liquid material in the tank or jar may be varied consid-

erably without affecting the operation. The liquid molten material entering the mold 9 will engage all portions of the record formed on the bore thereof, and the materially lower temperature of the mold will result in the almost instantaneous chilling of the surface of the molten material therein. In order to facilitate this surface-chilling of the liquid molten material entering the mold, the latter may be actually cooled by artificial means below atmospheric temperature—as, for instance, by the circulation of cold water through a water-jacket surrounding the mold or by a blast of cold air equably directed to all portions of the mold. The chilling of the surface of the molten material in the mold results in the setting of the positive impression thus secured from the negative record. The chilling of the molten material in the mold progresses toward the center, and any contraction in bulk will be compensated by the surplus material within the cap 11. As soon as the material within the mold has been chilled throughout the entire thickness thereof the material with the piston, core, cap, and plunger are removed from the cylinder, and the material is allowed to cool by exposure to a cold atmosphere or by an air-blast until the solidified material has contracted away from the bore of the mold, so as to permit it to be removed therefrom by forcing the plunger downward. The plunger is then removed from the core, and the latter is extracted from the cast duplicate, carrying the positive record on its periphery before the material has contracted sufficiently upon the core as to prevent this separation. Since the conductivity of heat from the material is effected slowly, the outer surface of the molded duplicate becomes hard and set, while the inner portion thereof next to the core is still in a relatively plastic condition, so that this separation of the core can with ordinary care be readily effected. The resulting duplicates thus secured after reaching the normal temperature are properly dressed at the ends and are reamed internally to the proper size, being then ready for use.

With records made by my process the contraction of the material radially to separate it from the mold is accompanied by a considerable longitudinal contraction following the instant when the surface is first set by the chilling effect of the mold and progressing until the material reaches the normal temperature, such shrinkage being approximately one per cent. with ordinary blanks. For this reason it is desirable that the original record from which the matrix is made is formed on a phonograph or allied talking-machine having a fewer number of threads on its feed-screw than the instrument on which the duplicates are finally used, in order that when the contraction has progressed to its finality the pitch of the record-thread on the duplicate will correspond to the pitch of the feed-screw of the reproducing-machine or approximately to that pitch, it being possible

with modern reproducing apparatus to effect a satisfactory reproduction from a record, even when the pitch thereof differs slightly from that of the feed-screw of the machine.

5 The pitch of the feed-screw of the machine on which the original record is made will differ from the pitch of the feed-screw of the machine on which the resulting duplicates are to be used to an extent depending upon the
10 coefficient of contraction of the material used and will be determined by experiment with the material employed. It will be of course understood that after the mold has been removed from the cylinder and the separation
15 of the cast duplicate is being effected therefrom a new mold and its accompanying parts may be inserted in place upon the cylinder, and the operations repeatedly carried on therewith.

20 Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. The process of duplicating cylindrical phonographic records, which consists in first
25 making an original record with a spiral record-groove of greater pitch than that desired on the duplicate to be produced, then in making a hollow cylindrical matrix or mold from said original record, carrying the record in negative on its bore, and in finally making duplicate records from the matrix or mold by introducing therein and engaging therewith material maintained in an abnormally high temperature, whereby the cooling of such duplicate will contract the pitch of the record-groove, as and for the purposes set forth.

2. The process of duplicating phonographic records, which consists in securing a mold containing the record in negative on its bore,
40 in introducing a molten material in the mold to receive a surface impression from such record, in allowing the molten material to set, in contracting the set material, and in separating the contracted molded material
45 by a longitudinal movement, substantially as set forth.

3. The process of duplicating phonographic records, which consists in securing a mold having a record in relief in negative on its
50 bore, in introducing a molten material in the mold around a core, in allowing the molten material to set, in contracting the set material, in removing the contracted material and the core from the mold, and in separating the core from the molded material, substantially as set forth.

4. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold with a record in negative on its bore, in introducing a molten material in the mold to form a cylindrical duplicate, in allowing the duplicate to set, in contracting the duplicate, and in removing the contracted duplicate by a direct longitudinal movement, substantially as set forth.

5. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold having the record in negative on its bore, in introducing molten material in the mold around a core, whereby
70 a hollow cylindrical duplicate will be formed, in allowing the molten material to set, in contracting the molten material, and in withdrawing the contracted material from the mold by a direct longitudinal movement, substantially as set forth.

6. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold carrying the record in negative on its bore, in introducing a molten
80 material in the mold around a core, in allowing the material to set, in contracting the material, in withdrawing the contracted material and core from the mold, and in separating the core from the resulting duplicate, substantially as set forth.

7. The process of duplicating cylindrical phonograph-records, which consists in making a cylindrical mold carrying a record in negative on its bore, and of sufficient mass
90 to produce a chilling effect on molten material introduced therein, then in introducing within the mold a molten material, the surface of which becomes chilled by contact with the mold, then in contracting the duplicate
95 so formed, and finally, separating the duplicate from the mold by a direct longitudinal movement, substantially as set forth.

8. The process of duplicating cylindrical phonograph-records, which consists in securing
100 a mold carrying a record in negative on its bore, and of sufficient mass to produce a chilling effect on molten material introduced therein, then in introducing within the mold around a core a molten material, the surface
105 of which is chilled by contact with the mold, then in contracting the material, then in removing the contracted material and core from the mold, and in finally separating the core from the material, substantially as set forth.

9. The process of duplicating cylindrical phonograph-records, which consists in maintaining in a molten condition a mass of material from which the duplicates are to be made,
115 in sustaining a mold over the mass of molten material, said mold carrying on its bore a record in negative, in successively elevating a part of the mass of molten material into the mold, in allowing such molten material
120 within the mold to set, in contracting the set material, and in withdrawing the resulting duplicate from the mold by a direct longitudinal movement, substantially as set forth.

This specification signed and witnessed
125 this 30th day of April, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,
FRANK L. DYER.

1294

No. 676,225.

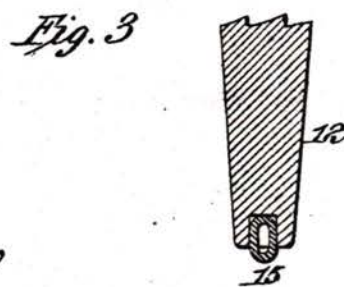
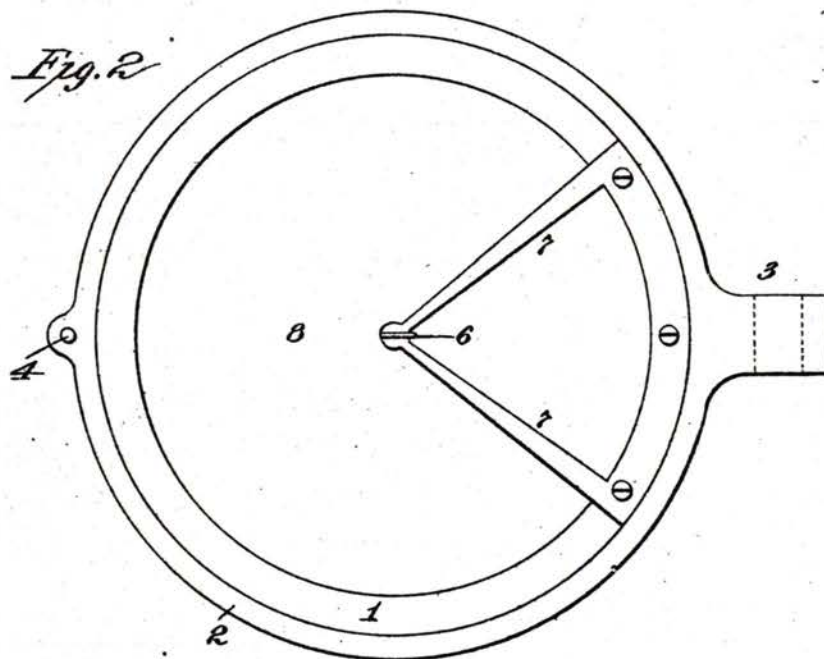
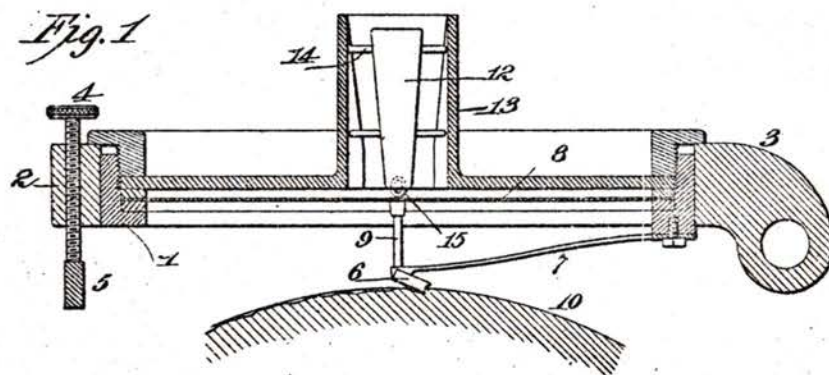
Patented June 11, 1901.

T. A. EDISON.

PHONOGRAPHIC RECORDING APPARATUS.

(Application filed Aug. 18, 1900.)

(No Model.)



Witnesses:

John F. Whelan
Archibald G. Brown

Inventor

Thomas A. Edison

By *Wm. Edmonds Sawyer*
Att'ys

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPHIC RECORDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 676,225, dated June 11, 1901.

Original application filed March 17, 1899, Serial No. 709,448. Divided and this application filed August 18, 1900. Serial No. 27,238. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographic Recording Apparatus, (Case No. 1,046,) of which the following is a description.

My invention relates to improvements in apparatus for making phonographic records, and the present application is a division of an application for Letters Patent of the United States filed by me on March 17, 1899, Serial No. 709,448. In said application I describe generally such an arrangement of the diaphragm or other element influenced or vibrated by the sound-waves as to normally relieve it of all or substantially all stress, whereby it will be maintained in substantial equilibrium and will be more sensitively receptive and more accurately responsive to sound-vibrations. The present invention relates to a phonographic recorder of this type, and specifically to a phonographic recorder of the kind wherein the usual compensating weight is dispensed with and the cutting or recording tool is caused to engage the record-surface by a direct manual adjustment.

The object of my present invention is to so construct or arrange the diaphragm of manually-adjusted phonographic recorders as to relieve the diaphragm of all or substantially all stress now resulting from the pressure necessary to properly engage the cutting or recording tool with the record-surface to the requisite depth.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a section through a phonographic recording device of the type described, illustrating my present improvements applied thereto; Fig. 2, a bottom view of Fig. 1, and Fig. 3 an enlarged sectional view of the lower portion of the compensating weight.

In all of the above views corresponding parts are represented by the same numerals of reference.

The casing 1 is carried in a ring 2, formed in a pivoted arm 3, having an adjusting-screw 4, which works on the usual longitudinal slide 5. The cutting or engraving tool 6 is carried on the end of spring-arms 7 7 (shown more clearly in Fig. 2) and is connected with the center of the diaphragm 8 by a connection 9, made, preferably, of wood. In use the adjusting-screw 4 is turned until the cutting or engraving tool 6 engages the proper depth into the recording-surface 10. This obviously places the diaphragm 8 under stress, or, in other words, tends to buckle it upwardly, preventing accurate response thereof to the vibrations. With this type of recorder in order that my invention may be carried out a weight is preferably employed to counteract this upward stress of the diaphragm. This counteracting-weight 12 is located, preferably, in the nipple 13, to which the speaking-tube is connected, being guided by the arms 14 and having a recess at its lower end, in which is placed, preferably, a section of rubber tubing 15, (see Fig. 3,) which bears upon the center of the diaphragm 8. The mass of the weight 12 is sufficient to substantially counteract the upward stress exerted upon the diaphragm by the engagement of the cutting or engraving tool with the recording-surface. By employing the elastic buffer 15 between the diaphragm 8 and the weight 12 the effect of the weight will be exerted at all times upon the diaphragm, even though the vibrations are so rapid that the weight cannot respond thereto.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a phonograph-recorder, the combination with the recording-diaphragm, of a counteracting-weight loosely and bodily carried thereby, substantially as set forth.

2. In a phonograph-recorder, the combination with the recording-diaphragm, of a counteracting-weight bodily carried thereby, and an elastic connection between the weight and diaphragm, substantially as set forth.

3. In a phonograph-recorder, the combination with the recording-diaphragm, the recording-tool directly connected thereto, and means

for manually adjusting the diaphragm, of a counteracting-weight carried loosely and bodily by the diaphragm, substantially as set forth.

5 4. In a phonograph-recorder, the combination with the recording-diaphragm, the recording-tool directly connected thereto, and means for manually adjusting the diaphragm, of a counteracting-weight carried bodily by the
10 diaphragm, and an elastic connection between said weight and diaphragm, substantially as set forth.

15 5. In a phonograph-recorder, the combination with the recording-diaphragm and its inclosing casing, of a counteracting-weight carried bodily by the diaphragm and vertically

movable within said casing, substantially as set forth.

6. In a phonograph-recorder, the combination with the recording-diaphragm and its inclosing casing, of a counteracting-weight carried bodily by the diaphragm and vertically movable within said casing, and guiding-arms for guiding said weight in said casing, substantially as set forth. 25

This specification signed and witnessed this 10th day of August, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,
J. A. BOEHME.

1297

No. 713,209.

Patented Nov. 11, 1902.

T. A. EDISON.

PROCESS OF DUPLICATING PHONOGRAMS.

(Application filed Mar. 5, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1^a

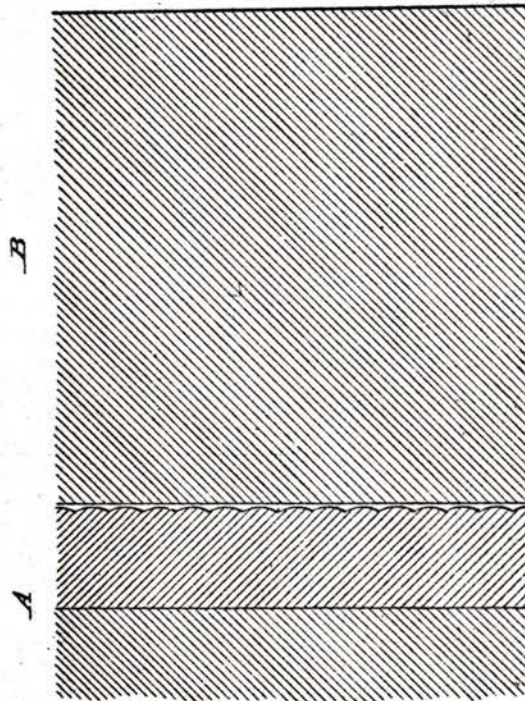
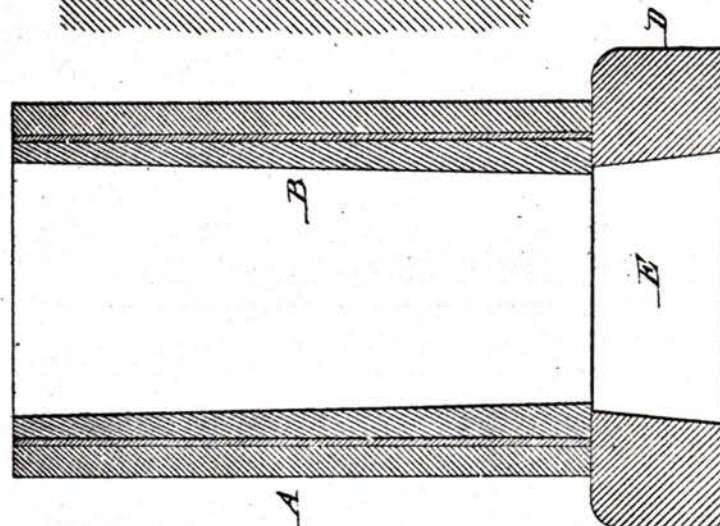


Fig. 1



Witnesses:

Jas. F. Coleman
Geo. Robt Taylor

Inventor .

Thomas A. Edison
by Alfred Edmunds

Att'ys.

1298

No. 713,209.

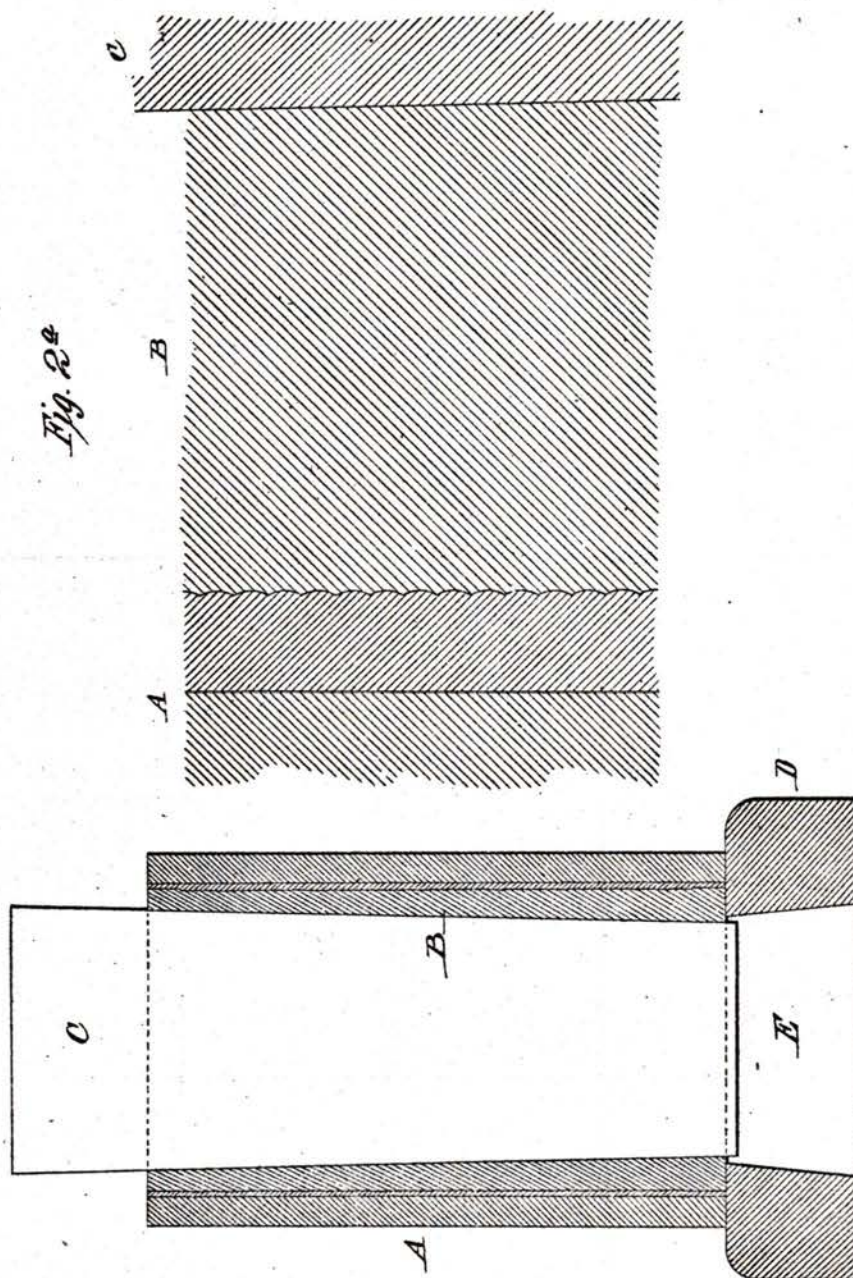
Patented Nov. 11, 1902.

T. A. EDISON.
PROCESS OF DUPLICATING PHONOGRAMS

(Application filed Mar. 5, 1898.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses:

Geo. F. Coleman
Geo. Robt Taylor

Inventor

Thomas A. Edison
by Ayer Edmund Ayer
Att'ys

1299

No. 713,209.

Patented Nov. 11, 1902.

T. A. EDISON.

PROCESS OF DUPLICATING PHONOGRAMS.

(Application filed Mar. 5, 1898.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 3^a

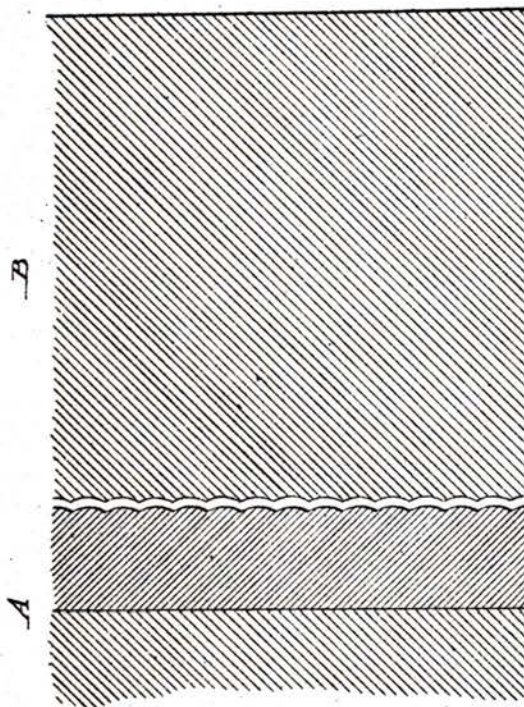
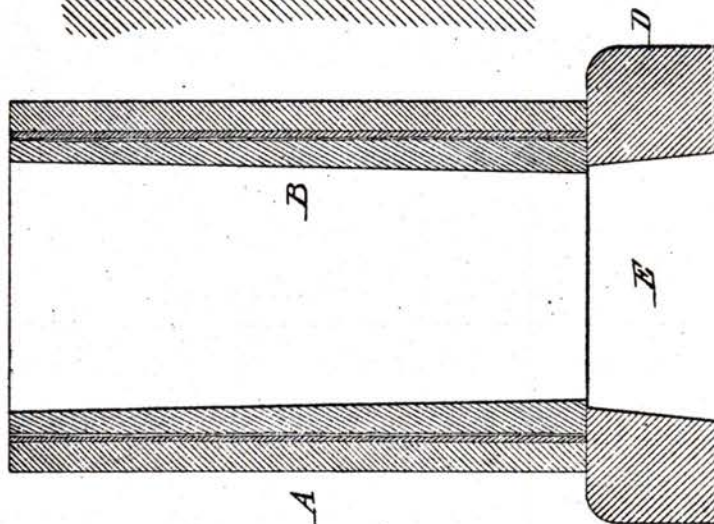


Fig. 3



Witnesses:

Jas. F. Coleman
Wm. Robt. Taylor

Inventor

Thomas A. Edison
byAYER EDWARDS & CO.
Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 713,209, dated November 11, 1902.

Application filed March 5, 1898. Serial No. 872,650. (No specimen.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes of Duplicating Phonograms, (Case No. 994,) of which the following is a specification.

The object I have in view is to produce a practical process for the duplication of phonographic records, whereby a practically unlimited number of duplicate phonographic records may be obtained which will be absolutely identical in every respect with the original record. Generally I propose to construct a suitable matrix, preferably in metal, and by its use to impress duplicate phonograms with a phonographic record thereon, such phonograms being preferably constructed of a material having a greater coefficient of expansion than the material of the matrix or mold.

By my process the duplicate phonogram or the surface thereof may be and preferably is constructed of a material too hard for the satisfactory cutting of an original record therein by the usual phonographic recorder, whereby the duplicate phonograms may be made more durable than it is possible to make original records; but the duplicate phonograms may obviously be made of a softer material.

My improved process can be carried out for the reproduction of phonographic records of any desired form, either flat disks or hollow cylinders; but it has been specially devised for use in connection with the duplication of records of the latter type. For the duplication of cylindrical phonographic records from a tubular matrix my improved process also provides for the effective removal of the finished duplicate from the matrix without injury to the record-surface of the former.

In carrying my process into effect I first construct a matrix carrying a negative representation of the record, which matrix can be produced by any of the known processes—as, for example, those indicated in my Patent No. 484,582, dated October 18, 1892. As I explained in this patent, an original phonographic record having a surface of the usual wax-like material is first secured and its sur-

face coated with a coating of conducting material in order to permit the original record to be electroplated. This conducting coating can be and preferably is applied by a process of vacuous deposit, as I described in my Patent No. 527,147, dated September 18, 1894, by placing the record in a vacuum-chamber in which a metal is vaporized by an electric arc produced between electrodes of the metal, the metallic vapor depositing as a thin uniform coating on the original record. I prefer to apply a preliminary coating by a process of vacuous deposit, for the reason that the highly-comminuted condition of the vaporized metal permits the coating to form as a uniform film, following accurately all the variations of the record, however minute. Instead of coating the original record with a vaporized metal it may be coated with a very thin layer of specially-prepared plumbago of exceedingly-great fineness, or instead thereof gold-leaf or silver salts reduced by chemical reagents to the metallic state may be used for the same purpose. Having thus applied a very thin preliminary coating to the original record, the latter is immersed in an electroplating bath and electroplated with a metal to the desired thickness, thereby forming a shell inclosing the original record, which shell carries on its bore an accurate negative representation of that record. Preferably this shell is suitably incased in a close-fitting cylindrical jacket, although if the electroplating is carried on long enough to form an electroplated coating of sufficient thickness a jacket need not be used. The original record is removed from the electroplated matrix obtained as described either before or after the jacket, if used, is applied to the shell. This removal of the original record can be effected either by dissolving or melting the wax-like material or by contracting the original record radially and removing it by a direct longitudinal movement. In the case of cylindrical phonographic records the resulting matrix will be a hollow metal cylinder or tube or one internally faced with metal carrying the phonographic record in relief upon its inner surface.

While I have indicated convenient and well-known methods for producing the ma-

trix, it will be obvious that the matrix can be obtained in any other way familiar to those skilled in the art.

Having obtained a suitable matrix carrying
5 a negative representation of the original phonographic record to be duplicated, I proceed with the duplication of the records as follows: The blanks which are to receive the duplicate records are preferably composed of a material
10 having a higher coefficient of expansion than that of the matrix or mold, and said blanks are made sufficiently thick to maintain their shape during and after the act of disengagement from the matrix, as will be explained. The blank under normal temper-
15 atures is of a diameter very slightly less than the bore of the matrix or mold, whereby the blank may be inserted in the same. After the blank has been thus placed within the
20 matrix or mold both the matrix and the blank contained therein are, or the blank alone is, brought to a higher temperature, whereby the blank will expand and will be brought into intimate contact with the record-surface of
25 the matrix or mold, whereby the negative record thereof will be impressed with absolute accuracy upon the surface of the blank. The expansion of the blank into this intimate engagement with the interior of the
30 matrix or mold may be effected in any suitable way, such as by maintaining the matrix or mold, with the blank contained therein, in a heated atmosphere. By making the blank of a material having a higher coefficient of
35 expansion than the matrix or mold the blank will be properly expanded to receive the impression of the record, notwithstanding the fact that both the blank and the matrix or mold may be subjected to the same tempera-
40 ture.

In order to facilitate the operation and make the resulting duplicate record somewhat sharper, I prefer to introduce a tapering mandrel within the blank after the blank
45 has been placed in the matrix or mold and heat applied to the blank, as explained, and to force the mandrel tightly within the blank after the latter has been expanded into engagement with the record, whereby the blank
50 will be further expanded mechanically into absolute intimacy with the record, after which the mandrel will be immediately withdrawn. With blanks made of sufficiently viscous material the entire expansion may be effected
55 mechanically by forcing a tapering mandrel within the same.

After the blank has been expanded, so as to receive the impression of the matrix or mold, it is removed by first shrinking it radially in any suitable way, as in a refrigerating-chamber, and by then withdrawing the resulting duplicate record by a direct longitudinal movement. Owing to the shallowness
60 of the phonographic-record groove this radial shrinkage of the duplicate record effects a sufficient separation of the surfaces of the

matrix and of the duplicate record to prevent injury to the surface of the duplicate record due to any longitudinal contraction thereof.

I find that by the process above described,
70 and particularly when a matrix or mold is obtained by a process of vacuum deposit, as explained, duplicate phonographic records can be obtained which will be accurate reproductions of the original records and be free
75 from extraneous noises and wherein the quality and intensity of the original vibrations will be reproduced with absolute faithfulness. I find, moreover, that since by this process there is little or no wear upon the matrix or
80 mold a practically unlimited number of duplicates may be obtained from a single matrix or mold.

The degree of heat necessary to properly expand the blank will depend largely upon
85 the material of which the blank is formed and upon the closeness of fit of the blank when inserted within the matrix or mold. For the same reasons the extent of the reduction of temperature in chilling and shrinking
90 the duplicate record will vary to a considerable extent.

The invention is illustrated in the accompanying drawings for convenience in connection with a cylindrical phonogram.

In the drawings, Figure 1 is a sectional view showing a matrix or mold with a blank introduced therein prior to the expansion of the blank into engagement with the record-surface of the matrix; Fig. 1^a, a section
100 through a part of the walls of the blank and matrix very greatly enlarged; Fig. 2, a view similar to Fig. 1, showing the blank expanded into engagement with the matrix and illustrating also a tapered mandrel forced into
105 the blank; Fig. 2^a, a view corresponding to Fig. 1^a, showing a part of the walls of the matrix, blank, and mandrel of Fig. 2, very greatly enlarged; Fig. 3, a view corresponding to Figs. 1 and 2 with the tapered mandrel
110 removed and illustrating the formed duplicate as having been contracted radially preparatory to being removed from the blank by a direct longitudinal movement; and Fig. 3^a, a section, very greatly enlarged, corresponding
115 to Figs. 1^a and 2^a and illustrating the relative relation between the duplicate and matrix prior to the removal of the former.

In the views corresponding parts are represented by the same letters of reference.

A represents the matrix or mold, carrying on its bore a negative representation of the record to be reproduced.

B represents the blank to be duplicated, which is preferably provided with a tapered
125 bore, as is now common, and which is of sufficient thickness to maintain its shape during and after the act of disengagement from the matrix. This blank is turned down so that it may be inserted within the matrix or mold with
130 a close fit, as shown in Figs. 1 and 1^a. The blank to be duplicated may be and prefer-

ably is of a harder material than can be practically or satisfactorily engraved, indented, or cut by a phonographic recorder, whereby the duplicate phonographic records will be more durable than could be obtained in the first instance by the operation of a recording or indenting device actuated directly by the sound-waves. These blanks may therefore be made of a relatively hard material, such as asphalt, or of stearic acid or stearate of soda mixed with varying proportions of fine precipitates—such as chalk, slaked lime, or lamp-black—or waxes or resins may be used, such as sealing-wax or shellac mixed with fine precipitates, like chalk, or polished ebonite, vulcanized hard rubber, or celluloid may be used, or glue may be employed either alone or mixed with precipitates, such as chalk.

C, Figs. 2 and 2^a, represents a tapered mandrel, which may be inserted within the blank B.

D represents a support for the matrix or mold and for the blank within the same, said support having an opening E therein, whereby the mandrel C may be moved longitudinally within the blank.

In carrying out the process I first introduce the blank within the matrix with as close a fit as practical, as shown in Figs. 1 and 1^a, after which the mandrel C is inserted within the blank. These parts are then subjected to heat, such as by being maintained in a heated atmosphere, whereby the blank will, by reason of its greater coefficient of expansion than the matrix or mold, be expanded into intimate contact with the record-surface of the latter, and an impression of such record will be accurately received on the blank. When the blank has been thus expanded into engagement with the matrix or mold, the mandrel C is forced tightly within the blank, so as to further expand it mechanically, whereby the blank will be forced into absolute intimacy with the record, and an impression will be received on the blank which will be clear, sharp, and an absolutely faithful reproduction of the original record. After the mandrel has been forced within the blank it is immediately withdrawn, and the blank is then chilled in any suitable way, such as by placing the matrix, with the blank contained therein, in a refrigerating-chamber. In this way the blank or duplicate will shrink or contract radially, as shown in Figs. 3 and 3^a, sufficiently to be removed from the matrix or mold by a direct longitudinal movement. Owing to the extreme shallowness of the phonographic-record groove, a sufficient radial separation between the resulting duplicate and the matrix or mold will take place to prevent any longitudinal contraction of the duplicate from injuring the record-surface thereof.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. The process of duplicating sound-records

that consists in impressing a plastic record-tablet against a suitable matrix by its own expansive force.

2. The method of producing hollow cylindrical phonograms, which consists in obtaining a mold having a reverse phonogram-record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a radial contraction of the phonogram sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement.

3. The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a reverse phonogram-record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a reduction in temperature sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement.

4. The method of producing phonograph-cylinders which consists in placing within a hollow cylindrical record mold or matrix, a hollow cylindrical phonograph-blank of sufficient thickness to maintain its shape during and after its engagement with the matrix, outwardly expanding such blank against said matrix, disengaging the impressed record-cylinder from the matrix, and withdrawing said record-cylinder from the matrix by direct longitudinal movement.

5. The method of producing phonograms which consists in placing within a hollow cylindrical record-matrix a hollow cylindrical phonograph-blank of sufficient thickness to maintain its form under normal conditions, softening said blank by heat and expanding the same while heated so as to take the record from the matrix, shrinking the phonogram so made by change of temperature, and withdrawing the same from the matrix by direct longitudinal movement.

6. The method of producing phonograms which consists in placing within a hollow matrix a hollow body of plastic material, said body being a cylinder on its outer surface and having a tapering central longitudinal aperture, softening said body by heat and expanding it into the matrix by the longitudinal movement of a tapering plunger within the plastic body, shrinking the plastic material and withdrawing it from the matrix by direct longitudinal movement.

7. The process of duplicating phonograms having a phonographic record thereon, which consists in forming a matrix or mold wherein the original record will be reproduced in relief, in loosely engaging a blank phonogram with said matrix, and in finally intimately engaging the blank phonogram with said matrix or mold by changes in temperature, substantially as set forth.

8. The process of duplicating phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, and in intimately engaging a blank phonogram with the said matrix or mold by a change in temperature, substantially as set forth.

9. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the continuous cylindrical blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

10. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting the blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, in finally shrinking the blank to disengage it from the matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

11. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally subjecting the expanded blank to pressure to more intimately engage it with said record, substantially as set forth.

12. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, in subjecting the expanded blank to pressure to more intimately engage it with such record, and in finally chilling the blank to re-

move it from the matrix or mold, substantially as set forth.

13. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram to form a matrix or mold, in covering said matrix or mold with a metal backing, in introducing the continuous cylindrical phonogram to be reproduced within said matrix or mold, in expanding said phonogram into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

14. The method of producing phonograms, which consists in securing a hollow metallic mold or shell containing the reverse record, placing in said mold an expansible blank sufficiently thick to maintain its shape during and after its removal from the mold, expanding both by heat, impressing the record in the blank, contracting the phonogram so made by the withdrawal of heat, and removing the phonogram from the mold by a direct longitudinal movement, substantially as set forth.

15. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting within said matrix or mold a blank to be reproduced made of a material having a higher coefficient of expansion than said matrix or mold, and in heating the blank and matrix carried thereby, whereby the blank will be expanded into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

16. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing in a vacuum a metal vapor upon the original phonogram, electroplating a metal thereon so as to form a matrix or mold, in inserting the continuous cylindrical blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

17. The method of producing record-cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly

expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.

18. The herein-described process of molding sound-records in celluloid, which consists of softening a celluloid tablet and then forc-

ing the same against a suitable matrix by its own expansive force, substantially as described.

This specification signed and witnessed this 21st day of February, 1898.

THOMAS A. EDISON.

Witnesses:

J. F. RANDOLPH,
RICH'D. N. DYER.

**Complainant's Exhibit 145, Offered at
the Oral Argument on Final Hearing.**

AGREEMENT.

THE AMERICAN GRAPHOPHONE COMPANY

AND

JESSE H. LIPPINCOTT.

March 26, 1888.

THIS AGREEMENT, made this 26th day of March, in the year One Thousand Eight Hundred and Eighty-eight, by and between THE AMERICAN GRAPHOPHONE COMPANY, of West Virginia, of the one part, and JESSE H. LIPPINCOTT, of the City of New York, party of the second part.

WITNESSETH :

1. That for and in consideration of the several covenants and undertakings hereinafter expressed to be kept and performed by the party of the second part, the American Graphophone Company has agreed and does hereby agree to furnish to the said party of the second part, for sale or lease and use in the United States (excepting the States of Illinois, Wisconsin and Michigan) upon the terms, subject to the conditions and with the exceptions herein expressed, all the graphophone instruments and supplies therefor manufactured by or for the said American Graphophone Company for sale and use in the said territory, under its agreement with and license from the Volta Graphophone Company, to the extent of at least five thousand (5,000) of the said instruments in each year after the first year, it being understood that said American Graphophone Company shall speedily provide for the delivery of the three hundred instruments now

in process of manufacture, and shall arrange for the manufacture and delivery of at least one hundred instruments per week, with all possible dispatch, and as many more per week as the party of the second part shall in writing state that he will take and pay for, as hereinafter provided; but after said American Graphophone Company shall have arranged for a weekly output, as above, no increase in said number shall be required, except after notice in writing from the party of the second part, equal to thirty days, for each increase of thirty instruments per week. All requisitions by the party of the second part shall be in writing and shall be filled as promptly as may be with diligent effort by the said American Graphophone Company in the manufacture of the same.

The States of Illinois, Wisconsin and Michigan are excepted from this agreement, and as to the said three States, the said American Graphophone Company reserves and retains all its present rights as fully as if this agreement were not made.

Provided, that in case the said American Graphophone Company shall not make a contract with or grant license to any other person or persons for the said three States within ninety days after the execution of these presents, then the said three States shall be added to the territory included within this agreement, and be subject to all the provisions, terms and conditions herein contained.

Provided further, that if at any time after one year from the date of this agreement the said American Graphophone Company shall be unable to deliver to the said party of the second part, instruments and supplies, for which the said party of the second part shall have made due requisition, as herein provided, within a reasonable time after such requisition shall have been made, then the said party of the second part, after notice in writing to the said Company, shall have the right to

manufacture, or cause to be manufactured, instruments or supplies, or both, necessary to fill so much of such requisitions as the said American Graphophone Company cannot furnish, paying to the said Company on such instruments the sum of twenty-five (\$25) dollars each, and on such supplies the prices herein named, or hereafter mutually agreed upon, less the actual cost of such manufacture; and provided further, that such manufacture of instruments or supplies shall be under the supervision and approval of an inspector appointed by the said Company, the cost of whose services shall be added to the said sum of twenty-five (\$25) dollars; and provided further, that the party of the second part shall, in such case, give the said Company timely notice of the place where such manufacture shall be ordered, and the number so ordered, and no manufacture under this provision shall be begun, or agreement for such manufacture be made, until the same shall have been approved by the said American Graphophone Company in writing.

2. If, at the expiration of two years from the date hereof, there shall be in any portion of the territory covered by this agreement a demand for the said instruments or supplies which the said party of the second part shall neglect or fail to take appropriate measures on their (his) part to meet, the said American Graphophone Company may give notice thereof to the said party of the second part; and if, at the expiration of thirty days thereafter, the said neglect or omission still continues, the said American Graphophone Company may proceed to supply the said demand through agents or otherwise, provided it shall not interfere with the delivery, to the party of the second part, of instruments and supplies, for which requisition shall have been made by him.

3. The said American Graphophone Company further agrees to defend the said party of the second part against all suits for infringement, by reason of the said instruments or supplies of patents not owned or controlled by the said Company, and to pay all final judgments rendered in such suits, provided the said Company shall have notice of such suit and opportunity to defend the same, such notice to be given in time to allow the said Company to make answer, plea or other appropriate defense to the original bill, petition, complaint or other original pleading, and defend through counsel of its own selection; and the said American Graphophone Company further agrees to institute and prosecute proper legal proceedings for all infringements of the patents under which the said instruments and supplies shall be manufactured and used by the said Company, or its assigns or licensees, upon due notice being given to said Company of such infringement, and upon the said Company being advised by its counsel or counsel of its selection that such alleged infringement is unlawful, and that legal proceedings to restrain or enjoin the same, or to recover damages for such infringement can be successfully maintained.

4. The said party of the second part, for and in consideration of the foregoing agreements on the part of the said American Graphophone Company, has agreed and does hereby agree to take from the said Company and pay for on delivery, at the prices hereinafter specified, at least five thousand of the said graphophone instruments in each year, and as many more as diligent effort on his part can create a market or demand for; but until the said American Graphophone Company is able to begin its deliveries, as provided for in paragraph 1, the party of the second part shall only be required to take so many as said Company can with due diligence make and deliver.

5. The party of the second part agrees to pay for said graphophone instruments, in complete order and ready for use, delivered at the place of manufacture boxed, ready for shipment and free on board, ten (\$10) dollars on each of the first three hundred instruments over and above the cost of manufacture, inspection, adjustment, boxing and delivery; fifteen (\$15) dollars over and above the like cost on each of the next seven hundred instruments; and for all subsequent instruments the sum of forty (\$40) dollars each, provided that if the gross cost of the instruments to the said American Graphophone Company (including any royalties which the said Company may have to pay, and the usual manufacturers' profits, in case the Company shall establish its own manufactory) in complete order and ready for use, delivered at the place of manufacture, boxed, ready for shipment and free on board, shall exceed the sum of twenty (\$20) dollars each, then the additional cost beyond the said twenty (\$20) dollars shall be added to the said sum of forty (\$40) dollars and paid by the said party of the second part, provided that if any competing instruments shall be placed upon the market, and thereby render it advisable or necessary, in the opinion of the said Company, to reduce the selling price of the said company's instruments below eighty (\$80) dollars each, then the said forty (\$40) dollars shall be reduced pro rata; but no reduction in the selling price below eighty (\$80) dollars shall be made without the written consent of the said American Graphophone Company [and if the selling price of instruments is over one hundred (\$100) dollars, then the excess above this amount is to be equally divided between the American Graphophone Company and the party of the second part.]

The selling price of cylinders shall be fixed from time to time by the American Graphophone Com-

pany, but shall not be less than two cents each, or more than three cents each, except by mutual consent, and the party of the second part shall pay on delivery to said Company for said cylinders sixty per cent. of said selling price. At this price, said cylinders are to be boxed and crated for shipment, and delivered free on board at either of the depots of supplies which may be hereinafter designated by the said American Graphophone Company.

All parts of instruments shall be procured from the said American Graphophone Company and be paid for at one-half of the list prices that may be established by the said Company.

All instruments, parts of instruments, and supplies delivered to the said party of the second part, or upon his requisition within or during each and every month, shall be settled and paid for on or before the 15th day of the next following month, but the indebtedness of the said party of the second part, on account of such deliveries, shall not at any time exceed one-half of the penal sum of the bond given by the said party of the second part as security, as herein provided. This provision, as to the amount of indebtedness and times of settlement and payment, shall extend to and include all sums payable to the said Company on account of instruments, parts of instruments and supplies manufactured or caused to be manufactured by the said party of the second part, under and by virtue of the provisions contained in this agreement.

7. The said party of the second part agrees that he will not, nor shall his agents or employees, use, handle, buy or sell, directly or indirectly, any instruments, parts of instruments, appliances or supplies relating to the recording and reproduction of speech not manufactured by or for the said American Graphophone Company without the consent in writing of said Company.

8. The party of the second part agrees that he will take appropriate measures by personal effort and through advertisement, the establishment of agencies, and otherwise to introduce the said instrument, and provide for instruction in its use, and to create a demand for the instrument throughout the territory covered by this contract, and to supply the necessary capital for these purposes, and the said party of the second part especially agrees to devote such time, skill and services as may be required for the proper conduct of the said business.

9. This contract shall terminate in fifteen years from its date, and if the patents under which the said instruments are manufactured shall at any time be declared invalid by a Court of last resort, or shall be declared by the judgment or decree of such a Court to be an infringement of other patent rights, so as to lawfully prevent the manufacture, sale or use of the said instruments by the patentees or their assigns, then this contract shall terminate and the said American Graphophone Company shall not be liable to the party of the second part for damages by reason thereof.

10. If either of the parties hereto shall fail to keep and perform the provisions, conditions and covenants of this agreement, the other party shall have the right to terminate the same upon thirty (30) days' notice in writing, without prejudice to their existing claims.

The termination of this agreement, under either of the provisions herein contained, shall not prejudice any existing claim of the said American Graphophone Company for instruments, parts of instruments or supplies it shall have furnished to the party of the second part on his requisition.

In the event of any dispute between the parties hereto growing out of these articles of agreement, the same shall be settled by arbitration, each of the

said parties selecting one arbitrator, and these two selecting a third, and the decision of a majority of the said arbitrators shall be final, but if such arbitration shall fail from inability to agree upon a third arbitrator, or failure of a majority of such arbitrators to agree, or for any other cause, then the parties hereto shall be remitted to their other remedies under this agreement or as provided by law.

The said party of the second part shall, as a condition precedent, deliver to the said Company or its President, his bond in the sum of two hundred thousand (\$200,000) dollars, with sureties, to be approved by a vote of the Board of Directors of the said Company, conditioned for the faithful performance and observance of the said party of the second part of all the undertakings, conditions and covenants of this agreement on his part to be kept and performed.

This agreement is made on the part of the said American Graphophone Company, subject to the approval of its stockholders, by a majority vote, at a stockholders' meeting.

In testimony whereof, the said American Graphophone Company, by the signature of its President and Secretary, and the affixing of its corporate seal, and the said party of the second part, by its hand and seal, have executed these presents the day and year first above written.

In the presence of:

HARRY M. PAYNE,

JOHN F. COX.

JAMES G. PAYNE,

President of the American

Graphophone Company

[SEAL OF A. G. CO.]

of West Virginia.

AUSTIN HERR,

Secretary Am. G. Co.

JESSE H. LIPPINCOTT. [SEAL.]

**Complainant's Exhibit 146, Offered at
the Oral Argument on Final Hearing.**

IN THE UNITED STATES CIRCUIT COURT

FOR THE SOUTHERN DISTRICT OF NEW YORK.

JOHN E. HELM,
Complainant,

vs.

AMERICAN GRAPHOPHONE COM-
PANY, COLUMBIA PHONO-
GRAPH COMPANY, GENERAL,
AND NEW YORK PHONOGRAPH
COMPANY,

Defendants.

In Equity.

Bill of Complaint.

TO THE HONORABLE JUDGES OF THE CIRCUIT COURT
OF THE UNITED STATES, FOR THE SOUTHERN
DISTRICT OF NEW YORK.

JOHN E. HELM, of Newark, in the State of New Jersey, a resident and inhabitant of the State of New Jersey, who brings this suit on behalf of himself and all other stockholders of New York Phonograph Company who cause themselves to be made party thereto and share in the expense thereof, brings this, his bill of complaint, against the American Graphophone Company, a corporation duly organized and existing under the laws of the State of West Virginia, and having an office and

duly organized place of business at New York, in said District, and the Columbia Phonograph Company, a corporation duly organized and existing under the laws of the State of West Virginia, and having an office and duly organized place of business at New York, in said District, and New York Phonograph Company, a corporation duly organized under the laws of the State of New York, and having its principal office at Tarrytown, in the State of New York.

1. And thereupon your orator complains and says that Chichester A. Bell and Sumner Tainter, then of Washington, aforesaid, were the original, first and joint inventors of certain new and useful improvements in recording and reproducing speech and other sounds, which were not known or used in this country, or patented or described in this or any foreign country prior to their invention thereof, and which had not been in public use or on sale in the United States for more than two years prior to their application for letters patent therefor.

2. That on the 27th day of June, 1885, the said Chichester A. Bell and Sumner Tainter made application in due form of law to the Commissioner of Patents for the grant of letters patent of the United States for the said invention, and then and there fully complied in all respects with the provisions and requirements of the laws of the United States in such case made and provided.

3. That, due proceedings being had upon said application, upon the 4th day of May, 1886, letters patent of the United States, in due form of law, were issued and delivered to said Chichester A. Bell and Sumner Tainter in the name of the United States, under the seal of the Patent Office, and signed and countersigned respectively by the proper

officers of the United States, and numbered 341,214, granting to said Chichester A. Bell and Sumner Tainter, their heirs and assigns, for the term of seventeen years from said 4th day of May, 1886, the full and exclusive right to make, use and vend the said invention throughout the United States and the Territories thereof, as by reference to said letters patent, or a duly authenticated copy thereof, here in Court to be produced, will more fully and at large appear.

4. That the said Sumner Tainter was further the original, first and sole inventor of a certain new and useful improvement in apparatus for recording and reproducing sound or sonorous vibrations, not known or used in this country, or patented or described in any printed publication in this or any foreign country prior to his invention thereof, and not in public use or on sale in the United States for more than two years prior to his application for letters patent therefor.

5. That on the 4th day of December, 1885, said Sumner Tainter made application in due form of law to the Commissioner of Patents for the grant of letters patent for the United States for said invention, and then and there fully complied in all respects with the requirements and provisions of the laws of the United States in such case made and provided.

6. That due proceedings upon said application being had, upon the 4th day of May, 1886, letters patent of the United States were issued and delivered to said Sumner Tainter, in the name of the United States, under the seal of the Patent Office, signed and countersigned respectively by the proper officers of the United States, and numbered 341,288, granting to said Sumner Tainter, his

heirs or assigns, for the term of seventeen years from said 4th day of May, 1886, the full and exclusive right to make, use and vend the said invention throughout the United States and the Territories thereof, as by reference to said letters patent, or a duly authenticated copy thereof, here in Court to be produced, will more fully and at large appear.

7. That the invention or improvements described and claimed in said patent to Sumner Tainter were designed for and are capable of use conjointly, and are used conjointly, with the improvements or inventions described and claimed in the patent aforesaid of Bell and Tainter in recording and reproducing sounds.

8. That on the 29th day of March, 1887, said Chichester A. Bell and Sumner Tainter, by an instrument in writing, duly signed and delivered, and recorded in the United States Patent Office the 22d day of September, 1887, did give, grant and convey to the Volta Graphophone Company, a corporation organized and existing under the laws of the State of Virginia, its successors and assigns, the entire right, title and interest in and to said letters patent No. 431,214, granted to them as aforesaid, and in and to the inventions secured thereby, as by reference to said instrument, or to a duly authenticated copy thereof, here in Court to be produced, will more fully and at large appear.

9. That on the 29th day of March, 1887, said Sumner Tainter, by an instrument in writing, duly signed and delivered, and recorded in the United States Patent Office the 5th day of April, 1887, did give, grant, assign and convey to the said The Volta Graphophone Company, its successors and assigns, the entire right, title and interest in and to said letters patent No. 341,288, granted to him as afore-

said, and in and to the invention secured thereby, as by reference to said instrument, or a duly authenticated copy thereof, here in Court to be produced, will be more fully and at large appear.

10. That on the 29th day of June, 1887, the said The Volta Graphophone Company, by an instrument in writing, duly signed and delivered, did grant to the said American Graphophone Company the exclusive right and license, under the letters patent aforesaid, and each of them, to make, use and vend apparatus for recording and reproducing speech and other sounds, throughout the United States and the Territories thereof, as by reference to said instrument, or a duly authenticated copy thereof, here in Court to be produced, will more fully and at large appear; and that on the 24th day of January, 1893, the said The Volta Graphophone Company, by an instrument in writing, duly signed, sealed and delivered, and recorded in the United States Patent Office the 25th day of January, 1893, did give, grant, assign and convey to the said American Graphophone Company, its successors and assigns, the entire right, title and interest in and to said letters patent No. 341,214 and No. 341,288, and in and to the invention secured thereby, as by reference to said instrument, or a duly authenticated copy thereof, here in Court to be produced, will more fully and at large appear.

11. That the said American Graphophone Company has been, since the date of the assignment last mentioned, and is now, the owner of the said letters patent, and each of them, and of the rights and privileges secured thereby, and is and has been, since the date of the exclusive license described in paragraph ten of this bill of complaint, entitled to the exclusive right to make, use and vend the said inventions within the limits aforesaid, except as

hereinafter set forth, and has been and is, save for the doings of the said defendants and others acting in concert with them, in the exclusive possession of said rights and privileges, except as hereinafter set forth, and is entitled to the exclusive use, benefit and advantages of the said inventions and improvements, except as hereinafter set forth.

12. That the said inventions and improvements are of great commercial value and practical utility; that a great public interest has been manifested therein and a large demand created for apparatus constructed in accordance with or embodying the same; that in order to supply this demand, and to confer upon the public the advantages and benefits of the said inventions, the American Graphophone Company and its predecessors in title have invested large capital in acquiring said patents and in adapting and perfecting such apparatus, and have, at large expense, devised and constructed machinery, tools, appliances and other accessories necessary or useful in the manufacture of such apparatus, and have employed numerous skilled workmen, inventors and mechanics in connection therewith; and that such investment has been made and such expense incurred upon the faith reposed in the said letters patent, granted by the Government of the United States, as aforesaid, and in the rights and privileges secured thereby.

13. That on or about the 6th day of February, 1889, the North American Phonograph Company, a corporation organized under the laws of the State of New Jersey, acting under authority of and agreement with Jesse H. Lippincott, sole licensee of the said American Graphophone Company, by an instrument in writing under its corporate seal, granted to John P. Haines, acting for the New York Phonograph Company, a corporation to be organ-

ized under the laws of the State of New York, with the authority, assent and approval of the American Graphophone Company, the exclusive license to use and vend the inventions and improvements covered by said patents Nos. 341,214 and 371,288 within the State of New York, excepting the Counties of New York, Westchester, Richmond, Queens, Suffolk and Kings, until the respective termination of the said patents. By virtue of which instrument The New York Phonograph Company became possessed of the exclusive license to use and vend said inventions and improvements in said territory during the life of the said patents. And your orator has annexed to this bill, and made part thereof, a copy of said instrument, marked "Schedule A," and begs to refer thereto for greater certainty, if it be found necessary so to do.

14. That within six months from the date of said agreement the said John P. Haines caused the said The New York Phonograph Company to be organized as a stock company, under the laws of the State of New York, with a capital stock of \$1,250,000, divided into 12,500 shares of the par value of \$100 each, for the purpose of assuming the duties and obligations and transacting the business provided for by said agreement, and duly assigned to it his rights under the said agreement.

15. And on or about the 12th day of October, 1888, the said North American Phonograph Company, acting under authority and agreement with Jesse H. Lippincott, sole licensee of the American Graphophone Company, by an instrument in writing, under its corporate seal, granted to the Metropolitan Phonograph Company, a corporation duly organized under the laws of the State of New York, with the authority, assent and approval of the American Graphophone Company, the exclusive

license to use and vend the inventions and improvements covered by said patents Nos. 341,214 and 341,288, within the Counties of New York, Westchester, Richmond, Queens, Suffolk and Kings, in the State of New York, until the respective termination of said patents. By virtue of which instrument the Metropolitan Phonograph Company became possessed of the exclusive license to use and vend said inventions and improvements in said territory during the life of said patents. And your orator has annexed to this bill, and made part hereof, a copy of said instrument, marked "Schedule B," and begs to refer thereto for greater certainty, if it be found necessary to do so.

16. That thereafter, with the consent of the North American Phonograph Company, said Metropolitan Phonograph Company and said The New York Phonograph Company were, in or about the month of September, 1890, consolidated, under the laws of the State of New York, into a single corporation, said corporation being said defendant New York Phonograph Company, and thereupon, and by virtue of said consolidation, all the rights and privileges of the Metropolitan Phonograph Company and of the New York Phonograph Company, hereinabove set forth, and all other property of each of said two corporations, devolved upon, became invested in and were acquired by said New York Phonograph Company.

17. That the title to said patents Nos. 341,214 and 341,288, acquired by the said American Graphophone Company from The Volta Graphophone Company on the 24th day of January, 1893, as hereinbefore set forth in paragraph ten of this bill, enured to the benefit of said New York Phonograph Company, under the said licenses hereinbefore set forth.

18. That the validity of said patents Nos. 341,214 and 341,288 has been many times sustained by decrees of Courts of competent jurisdiction; that in a cause in the United States Circuit Court for the Northern District of Illinois, in which the American Graphophone Company was complainant, and Edward H. Amet was defendant, a decree was made on final hearing, sustaining the validity of claims 19, 20, 21, 22 and 24 of patent No. 341,214, the decision in which cause is reported in 74 Federal Reporter, page 789; that in a cause in the United States Circuit Court for the Southern District of New York, in which the American Graphophone Company was complainant and Cleveland Walcutt was defendant, a decree was made on final hearing, sustaining the validity of claims 7, 8, 10 and 17 of patent No. 341,214, and claims 1, 4 and 37 of patent No. 341,288, the decision in which cause is reported in 87 Federal Reporter, page 556; that in a cause in the United States Circuit Court for the Southern District of New York, in which the American Graphophone Company was complainant and Loring L. Leeds and others were defendants, a decree was made on final hearing, sustaining the validity of claims 19, 20, 21, 22, 23 and 24 of patent No. 341,214, the decision in which cause is reported in 87 Federal Reporter, page 873; that in a cause in the United States Circuit Court for the Southern District of New York, in which the American Graphophone Company was complainant and Cleveland Walcutt and Edward F. Leeds were defendants, a decree was made on final hearing, sustaining the validity of the claims of patent No. 341,214, covering sound records, as manufacturers, which claims are numbered 7, 8, 10, 12, 17 and 18; that the decision in said last named cause is not reported, but is referred to in the case of the American Graphophone Company *vs.* Walcutt, reported in 86 Federal Reporter, page 468; that in a cause

in the United States Circuit Court for the Southern District of New York, in which the American Graphophone Company was complainant and the Universal Talking Machine Manufacturing Company was defendant, brought to restrain the infringement of patent No. 341,214, Judge Lacombe, on the 3d day of September, 1902, on a motion for a preliminary injunction to restrain the defendant from infringing claims 7, 10, 17 and 18 of said patent, granted an injunction *pendente lite*, restraining the defendants "from directly or indirectly making or causing to be made, * * * any disk sound records whose production involved the employment of the engraving method of producing the original record, or the use of the wax-like recording material or engraving apparatus; likewise any matrix obtained from such original engraved sound record or from such wax-like original; likewise any engraving apparatus, tool or appliance," the decision in which cause has not been reported, and that said decree for preliminary injunction has been affirmed by the United States Circuit Court of Appeals for the Second Circuit.

19. That the said defendants and others acting in concert with them, since the grant of said letters patent, and each of them, and since the date of the exclusive license, last above mentioned, within the said Southern District of New York, and elsewhere in the State of New York, did jointly, wrongfully, unlawfully, and with intent to injure said New York Phonograph Company, and to deprive it of the just profits resulting from using and vending said inventions, have, without the license or consent of said New York Phonograph Company used or caused to be used, and sold or caused to be sold, a large number of machines and apparatus for recording and reproducing sounds, known as "Graphophones and Graphophone Tablets" and

"Graphophone Records," all containing or embodying or operating in accordance with the said inventions or improvements, substantially as described and claimed in the said Letters Patent Nos. 341,214 and 341,288, and each of them, and in infringement of the exclusive rights granted to said New York Phonograph Company as aforesaid; and that the said defendants jointly have derived and received, and still are deriving and receiving, great gains and profits from such unlawful use, but to what extent your orator is ignorant and cannot set forth, and threaten to continue such infringement in the future to a still greater extent.

20. That each machine or apparatus so used and sold by the said defendants contains, embodies or operates in accordance with the inventions or improvements covered by both the Letters Patent aforesaid, or material and substantial parts thereof, and especially by claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 27, 30, 31 and 32 of said patent No. 341,214; and by claims 1, 4 and 37 of said patent No. 341,288.

21. That your orator is a stockholder of said New York Phonograph Company holding one thousand and sixty shares of stock of the par value of one hundred dollars each; that the capital stock of the said New York Phonograph Company consists of twenty-five thousand shares of the par value of one hundred dollars each; that your orator's said stock was issued to him at the following dates: Five shares on December 15th, 1902, and one thousand and fifty-five shares on January 14th, 1903; and that your orator was a shareholder of said corporation at the time of the transaction of which he complains as aforesaid; that John P. Haines now is and for more than a year last past has been president of the New York Phonograph Company.

and during that time has had entire charge of its affairs; that on the first day of April, 1903, your orator caused demands in writing signed by your orator to be made in the said John P. Haines that a suit should be brought by the said New York Phonograph Company against the said American Graphophone Company and Columbia Phonograph Company General as follows:

"NEW YORK, N. Y., March 30, 1903.

"TO NEW YORK PHONOGRAPH COMPANY:

"I, JOHN E. HELM, a stockholder of New York Phonograph Company holding Ten hundred and sixty shares, hereby request said corporation forthwith to bring suit against the American Graphophone Company for infringing Letters Patent of the United States covering inventions of Alexander Graham Bell, Chichester A. Bell and Charles Sumner Tainter set out in the Contract dated October 12, 1888, made between the North American Phonograph Company and Metropolitan Phonograph Company. In default of its so doing I will bring such suit in my own name as stockholder on behalf of said corporation.

"(Signed) JOHN E. HELM."

"NEW YORK, N. Y., March 30, 1903.

"TO NEW YORK PHONOGRAPH COMPANY:

"I, JOHN E. HELM, a stockholder of New York Phonograph Company holding Ten hundred and sixty shares, hereby request said corporation forthwith to bring suit against the Columbia Phonograph Company General, for infringing Letters Patent of the United States covering inventions of Alexander Graham Bell, Chichester A. Bell and Charles Sumner Tainter set out in the contract

dated October 12, 1888, made between the North American Phonograph Company, Metropolitan Phonograph Company. In default of its so doing I will bring such suit in my own name as stockholder on behalf of said corporation.

"(Signed) JOHN E. HELM."

That the said John P. Haines in behalf of the said New York Phonograph Company refused to bring such suit and said that if your orator wanted any such suit brought he must do it himself; that on the thirty-first day of March, 1903, he caused similar notices in writing to be served on William F. Fahnestock, the treasurer, and James L. Andem, the secretary of the said New York Phonograph Company and that both of them refused to cause any such suit to be brought; that the said John P. Haines, William F. Fahnestock and James L. Andem are the managing trustees of the said New York Phonograph Company; that this suit is not a collusive one to confer on this Court jurisdiction of a cause of which it would not otherwise have cognizance.

22. Your orator, therefore, prays as follows:

1. That the said defendants American Graphophone Company and Columbia Phonograph Company General may be required by a decree of this Honorable Court to account for and pay over to said New York Phonograph Company all such gains and profits as have accrued or arisen, or been earned or received by the said defendants by reason of said unlawful doings of said defendants, and all such gains and profits as would have accrued to said defendant New York Phonograph Company, but for the unlawful doings of said defendants and all damages the said New York Phonograph Company has sustained thereby; and

2. That the defendants, the American Graphophone Company and Columbia Phonograph Company General and their associates, attorneys, servants, clerks, agents and workmen, may be perpetually enjoined and restrained by a writ of injunction issuing out of and under the seal of this Honorable Court, from directly or indirectly using or causing to be used, selling or causing to be sold, within the State of New York any machine or apparatus embodying or constructed or operated in accordance with the inventions or improvements set forth in the two letters patent aforesaid, or either of them; and

3. That your Honors will grant unto your orators a preliminary injunction, issuing out of and under the seal of this Honorable Court, enjoining and restraining the said defendants, American Graphophone Company and Columbia Phonograph Company General, and their associates, attorneys, servants, clerks, agents and workmen to the same purpose, tenor and effect, as hereinbefore prayed for, with regard to said perpetual injunction; and

4. That the defendants be decreed to pay the costs of this suit; and

5. That your orators may have such other and further relief as the equity of the case may require;

To the end, therefore, that the said defendants may, if they can, show why your orator should not have the relief hereby prayed for, and may full, true and direct answer make, but not under oath, answer under oath being expressly waived, according to the best and utmost of their knowledge, information, remembrance and belief, to the several matters hereinbefore averred and set forth, as fully and particularly as if the same were repeated,

paragraph by paragraph, and said defendants there-
to severally and specifically interrogated, may it
please your Honors to grant unto your orator a writ
of *subpoena ad respondendum* issuing out of and
under the seal of this Honorable Court, directed to
said defendants, the American Graphophone Com-
pany, Columbia Phonograph Company General, and
New York Phonograph Company, commanding
them to appear and make answer to this bill of com-
plaint, and to perform and abide by such order and
decree herein as to this Court may seem just.

And your orator will ever pray, &c.

PURDY, SQUIRE & ROWE,
Solicitors and of Counsel for
Complainant.

JAMES W. PURDY, Jr.,
Of Counsel.

STATE OF NEW JERSEY, } ss.:
County of Essex,

JOHN E. HELM, being duly sworn according to
law on his oath, says: I am the complainant in the
foregoing bill named. I have read the said bill.
The facts therein set forth as far as they refer to
my acts are true, and so far as they refer to the acts
of others, I believe them to be true.

JOHN E. HELM.

Sworn to and subscribed }
this 2d day of April, }
1903, before me.

[SEAL.] FRED'K C. FISCHER,
Notary Public
For New Jersey.

Schedule A.

[Schedule A sets forth a copy of the agreement made February 6, 1889, between the North American Phonograph Company and John P. Haines, for which see Complainant's Exhibit 49.]

Schedule B.

[Schedule B sets forth a copy of the agreement made October 2, 1888, between the North American Phonograph Company and the Metropolitan Phonograph Company, for which see Complainant's Exhibit 50.]

(Endorsed)—U. S. Circuit Court, Southern District of New York.—Filed April 3, 1903.—
John A. Shields, Clerk.

It is stipulated that the foregoing copies of Complainant's Exhibits 145 and 146 may be filed herein in lieu of the originals subject to any correction upon comparison with the originals by either party.

LOUIS HICKS,
Counsel for Complainant, N. Y.
P. Co.
ROBINSON, BIDDLE & WARD,
Counsel for Defendant, Nat'l
P. Co.

(Endorsed)—U. S. Circuit Court, Southern District of New York.—Filed Jun. 20, 1905.—
John A. Shields, Clerk,